ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 27. No. 6. WEEKLY. | NEW YORK, WEDNESDAY, AUGUST 7, 1895. | $3 per Annum. Single Copies, 10 Cents.

Copyright, 1895, by ELECTRICAL REVIEW PUBLISHING COMPANY, 13 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

The entire platinum output of the Ural Basin, a foreign journal announces, has been sold at very high prices for 10 years ahead. Some years ago this metal cost 2,700 roubles per pood of 36 English pounds. In 1895 an English firm acquired the decadal production of the Tagil Mines at the price of 8,000 roubles per pood. Now a French electrical company has concluded a contract with the remaining Ural mines for the supply of the 10 years' output at the rate of 12,500 roubles.

The following anonymous lines are from London *Lightning*:

Lives of many men remind us
We to great success can climb,
If the reading public find us
Advertising all the time.

A novel departure has been taken by the owner of a windmill at Bremen, Germany. Instead of making his windmill drive a dynamo, he will use an electric motor connected with the town electric mains for driving his machinery when a calm prevails.

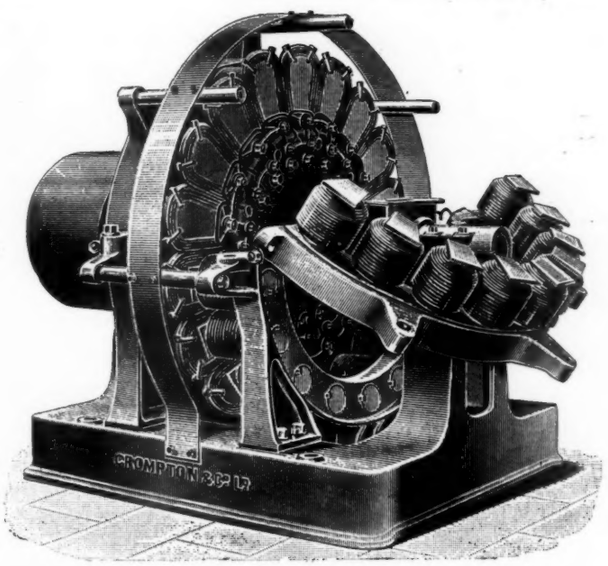
The world's supply of copper in 1894 was 319,391 long tons, of which North America supplied 175,290 tons. The United States continues to be the heaviest contributor to the English market.

"You seem to think that you own the earth!" exclaimed the irritable man.

"No," replied the haughty citizen, thoughtfully; "I don't own the earth, but I've got some stock in a street railway company."—*Washington Star.*

Since the organization of the traction railway companies to lease and operate and equip with electric motive power the old lines of horse railway in Philadelphia, public attention has been directed to the value of street car stocks as investments. The shares of capital of the old horse car plants sell at phenomenal premiums on their face value without mentioning their paid-up value. The stock of the Fifth and Sixth streets road brought, at its last sale, $333 a share. Its par value is $50 a share full paid. The stock of the Tenth and Eleventh streets road brought, at its last sale, $280. Its par value is $50 a share, of which an average of less than $20 has been paid.

A delegate to the recent Baptist convention in Baltimore hailed a trolley car, walked around to the front, deposited his carpet sack on the fender and then started for a seat.



CROMPTON ALTERNATOR WITH HINGED FIELD GIVING EASY ACCESS TO ARMATURE.

"Here, you! Come back here and take this thing off!" sung out the motorman.

The visitor realized that he had made a mistake. He went back, took his valise, and remarked apologetically to the motorman, the conductor and the passengers: "I thought that thing was put there to carry a fellow's traps."

The ELECTRICAL REVIEW was recently told that the Westinghouse Electric and Manufacturing Company had sold electric railway apparatus to be used in Syria. In response to an inquiry an official of the company wrote as follows: "We are surprised that you should think it extraordinary for our apparatus to be operated at Mount Lebanon, when at the same time we have equipments on an electric road in Bethlehem and Westinghouse motors also cross the river Jordan. The only difference is that all these places happen to be in Pennsylvania instead of Palestine, and I am afraid that this spoils a good item for the REVIEW."

John F. Cooley, of Rochester, N. Y., has invented an air ship which he thinks will be able to weather any gale. According to press dispatches "he will depend for his power upon a specially constructed electric motor of five horse-power weighing 60 pounds." If Mr. Cooley has a five horse-power motor weighing only 60 pounds he can make more money by manufacturing and selling the motors than he'll ever get out of his air ship.

Mr. Rodriguez's Address Wanted.

Will Mr. A. M. Rodriguez, one of the inventors of the electric headlight for bicyclists illustrated in the ELECTRICAL REVIEW for July 24, kindly send his present address to this office?

Crompton & Company's Alternating Current Work.

In 1891 Messrs. Crompton & Company, of London, England, commenced building alternators, working first at a type having an iron-cored stationary armature and bearing a close resemblance to one lately put on the market by a well-known firm. For various reasons this, though partially successful, was discarded in favor of the present type, as being the most suitable all-round pattern, giving the highest efficiency, working with least noise and using a minimum of metal in its construction. At the same time, with alternators, as with lighting systems, no one type of system can be considered as always the best for every condition and for special conditions, such as extra high electro-motive force or very low—Crompton & Company would, no doubt, build a different class of alternator (*e. g.*, in a 250-kilowatt alternator which they have recently constructed for a very low—and low electro-motive force, the armature has a cylindrical iron core and winding, somewhat resembling an ordinary drum winding). Several hundred kilowatts of these alternators have already been manufactured and are at work, and some 400 kilowatts are in hand at the present time in various sizes from five to 200 kilowatts. The present type of alternator, of which the manufacture was regularly commenced in 1892, is on the well-known lines of the old Siemens alternator of 1878, resembling in this respect the present Siemens and Ferranti machines, from which it differs, however, in many constructional details. A special feature is the method of supporting and tightening up the armature coils. Each coil is held by a wrought delta metal bolt between two strong bronze brackets, which secure it to the hub keyed to the shaft, and by means of an eccentric bolt can be moved in or out radially. By drawing all the coils in together they are very tightly compressed one against another, making a very rigid armature and doing away with all possible chance of detrimental vibration of the con-

ductors and destruction of the insulating material; moreover, a coil can be taken out and replaced with great ease. Another feature is the hinging of the field magnets, whereby the whole armature can be easily inspected, as shown in the accompanying illustration, for which we are indebted to the London *Electrical Review*.

The brush gear also is of novel design, enabling any brush to be completely taken away from the machine while it is at work with safety and without interrupting the supply. The collectors are bronze rings mounted on ebonite on the armature hub, and one each side of the armature. As illustrating the good efficiency of these alternators, it is said that a pair of 37½-kilowatt each, 550 revolutions, constructed as motor alternators (*i. e.*, a continuous current motor coupled direct to an alternator on the same bedplate) for Sunderland corporation to Professor Kennedy's specification, gave a through efficiency of 84½ per cent, including the field excitation for both motor and alternator. The method of test was to put in continuous electrical energy into one of the motors, take it from one alternator as "alternating electrical energy" (at 2,500 volts), use this to drive the second alternator as a motor and obtain continuous electrical energy from the other motor used as a dynamo. All the measurements from which the efficiency was calculated were taken on the same set of instruments.

ELECTRIC RAILWAY NOTES.

Ground has been broken for the South Side electric line at South Bend, Ind.

The Syracuse, N. Y., Street Railroad Company has bought the Syracuse & East Side Railroad.

It is predicted that an electric railroad from Jacksonville to St. Augustine, Fla., will be in operation by January 1, 1896.

The Second Avenue Traction Company, of Pittsburgh, is seeking the contract for carrying the United States mail on its routes.

Within a short time both Conshohocken and Norristown, Pa., will have ordinances enacted requiring suitable fenders on all trolley cars.

Sheriff Austin has not yet decided on what day he will sell the Consolidated Street Railroad, but it is understood the sale will be made August 17.

Amelia Sternecker has invented a fender for trolley cars which will be given a trial by the San Francisco electric railways. She is but 17 years of age.

The Braddock Electric Railway Company and the Second Avenue Railway Company are having a dispute over the occupancy of Bessemer avenue, Braddock, Pa.

City Attorney Toomey, of Bridgeport, Conn., by direction of the Common Council, has begun an investigation of the manner in which the traction company laid its tracks.

The Toledo, Ohio, Traction Company will have a fine plant when they have completed their improvements at the corner of Water and Madison streets, improvements that represent a cash outlay of $300,000.

It is stated that it is the intention of the New York, New Haven & Hartford Railroad Company to equip a portion of its line in New Bedford, Mass., with electricity, after the fashion of the branch now being operated at Nantasket Beach.

The chancellor of New Jersey has just decided that the Traction company connecting Newark and Passaic, cannot cross the Erie tracks at Franklin at grade. This means an additional outlay of $20,000 for the Traction company, as they must raise the Erie tracks and go under.

Having failed in his attempt to pass an ordinance requiring a four-cent fare on the street railway lines of Milwaukee, Wis., Alderman Thuering now proposes to introduce a three-cent fare ordinance. When this ordinance is killed, as it inevitably will be, Mr. Thuering may be expected to introduce a two-cent fare ordinance.

The recent sale of $37,500 increased capital stock of the Quincy & Boston Street Railway Company was very flattering to the management of that road. One small block was sold at $115.50 and the balance sold at a higher rate, most of it bringing $120 or more. The road is now capitalized at $300,000 and has a rapidly growing business.

The opposition of the Steinway Electric Railway, operated from the Hunter's Point ferries to College Point, Long Island, N. Y., has made such large inroads in the traffic and receipts on the North Shore division of the Long Island railroad that the company has announced another reduction in the fare beginning August 1.

At the power house of the Nassau Electric Railroad Company, at the foot of 39th street, Brooklyn, N. Y., an effort is being made to strike a well to supply water for the company. The drill has already penetrated over 300 feet and has struck water twice on its progress downward. The first water struck was not sufficient in quantity and the second was salt water.

The Milwaukee, Wis., city board of equalization has decided that all franchises as franchises be assessed and entered on the lists as such. The original assessment of the Minneapolis Street Railway Company, amounting to $200,000, was reduced one-half, owing to the fact that the company already pays a tax of $25 per car for the privilege of running them through the streets.

The United States Post Office Department has, it is reported, agreed upon a miniature pennant, modeled from the pennant used on steamships carrying the United States mails, for street cars carrying the mails. The pennant will be two feet long, red, with a blue border, with the eagle and an inscription, "United States Mail," in white letters. The pennant will only fly when the mail is on the car.

The roof on the new car barn of the Fair Haven & Westville Road in Fair Haven, Conn., has just been put on and the barn is now being used for the storage of cars. This makes the second large car barn which the road has put up within a year and the combined barns will be sufficient to house all the rolling stock of the company. The new car barn of the New Haven Street Railway Company on Ferry street, New Haven, has just been completed.

George W. Henderson, receiver of the Knoxville, Tenn., Electric Railway Company, has filed a bill in equity in the United States Circuit Court against the Union Trust Company, of Philadelphia, the trustee of one of the mortgages of the company, to recover $200,000, the proceeds of bonds said to have been paid to William G. McAdoo, Jr., the president of the railway company, and said to have been diverted by the latter to his own use.

Electric railways in Europe have increased in number during 1894 from 43 to 70, their length from 305 to 700 kilometres, the power at the central stations from 10,650 to 18,150 kilowatts, and the number of self-moving vehicles from 538 to 1,236. Germany leads in length of lines with 366 kilometres, then come France with 96, England 69, Austria-Hungary 45, Switzerland 37, Belgium 22, Italy 19, Spain 14. The overhead trolley system is used by 55 out of 70 lines.

It was reported in Philadelphia last week that the trolley railway through Fairmount Park will be built out of the proceeds of the first call of $3,000,000 on the stock of the Union Traction Company, which is the corporation that will lease the Philadelphia Traction Company, under its plan to absorb the three traction companies under which nearly all the street railways of the city are operated. The Fairmount Park Transportation Company is, it is stated, owned by the Philadelphia Traction Company, and, of course, it passes into the control of the Union Traction Company on the leasing of its owner.

It is reported that the Second Avenue Traction Company, of Pittsburgh, will make the fare for the round trip from Pittsburgh to McKeesport 15 cents during the days the State Council's sessions of the Jr. O. U. A. M. are held in McKeesport in September. By this means the Traction company expects to convey the delegates and visitors from Pittsburgh, Allegheny, South Side, Homestead and other places to McKeesport, and many thousand visitors from these places are expected to take part in the parade on September 17. The railroad companies have reduced their fares to 25 cents during the convention, but the trolley line will certainly carry the bulk of the people, and make nearly as good time as the steam cars.

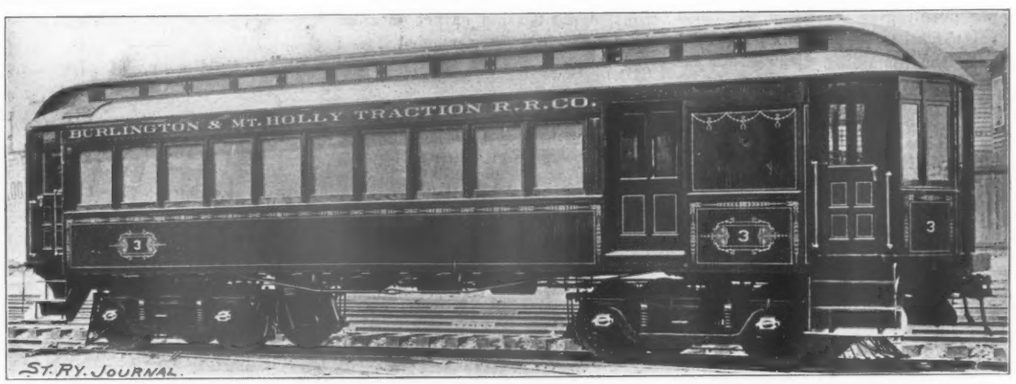


FIG. 1.—COMBINATION MOTOR CAR ON THE ELECTRICALLY EQUIPPED BRANCH OF THE PENNSYLVANIA RAILROAD AT MOUNT HOLLY, N. J.

Alonzo Burt, general manager of the Missouri & Kansas Telephone Company, has a novel plan of satisfying people who think they are paying too much for their telephones. During the day the operators keep a record of the 'phone of the complaining subscriber and at night know exactly how many times it has been used. A statement is made up showing the number of calls made and the number answered during the day, or the average for several days. The cost of the telephone for a year is then divided by the number of days to get the cost to the subscriber per day. A telephone that cost $72 per year costs about 20 cents a day. If the telephone has been used 20 times a day, each call has cost the subscriber just one cent or the price of a postal card.

Electrical Equipment of the Mount Holly Branch of the Pennsylvania Railroad.

The operation of the Mount Holly branch of the Pennsylvania Railroad by electricity was commenced July 23 and has proved successful. The line is about eight miles long, extending from Mount Holly, N. J., to Burlington, and is said to have been a non-paying line when operated by steam. The Pennsylvania Railroad therefore decided to adopt electric traction, using the overhead system, and the work has been done by the Westinghouse Electric and Manufacturing Company, of Pittsburgh. The accompanying illustrations are presented through the courtesy of the *Street Railway Journal.*

Span wire construction is used throughout. The poles are of chestnut and are all planted six feet six inches below the top of the lowest surrounding ground, so that on a hill and where there are ditches along the track, some of the poles are planted 15 feet in the ground. Over three-fourths of the poles are "barreled," and in some places the poles were pointed and worked down through quicksand and water. The top of every pole is exactly 25 feet from the top of the rail and on the poles which are used to carry feeders, the cross arms are placed 24 feet from top of rail. The trolley wire is 22 feet above the level of the rail.

The feeders are two in number, being each 500,000 circular mils. One runs the full length of the road, and the other three-fourths of the way. These cables were strung by a construction train, composed of a flat car, a pile-driver car and the locomotives. First came the flat car with the reels of cable, and a stand on which the reels were mounted. Next the pile-driver car, which had a boom fastened to the hammer of the pile-driver so that it could be raised and lowered at will. The side motion was obtained by using an eye bolt joint between the hammer and the boom. The reel being placed on the stand on the flat car, the boom was lowered and the cable passed through a snatch block at the end of the boom. The end of the cable was then made fast to the butt of first pole. The boom was raised above and swung sideways over the pole and the train started. The cable payed off the reel, passed through the snatch block and dropped on the cross-arms between the insulator and the pole top. Each reel contained about 2,000 feet of cable. This was transferred to the cross-arms in about seven minutes. After this the slack was partially taken out by fastening the end of the cable to the coupler on the locomotive and starting the train ahead. The remaining slack was taken up by using blocks and tackle in order not to strain the poles too much.

Following the construction train was a gang of men fastening the feeders into the insulators as soon as the slack was all taken up. When the reel was run out and the slack taken up, splices were made (see Fig. 3) and the train went on. All feeder splices on this line were made by hand and were about 22 inches in length and but slightly larger in diameter than the cable itself. By handling the feeder in this way it was never allowed to touch the ground, except at the ends where splices were made, thus avoiding all chafing and abrasion of the insulation.

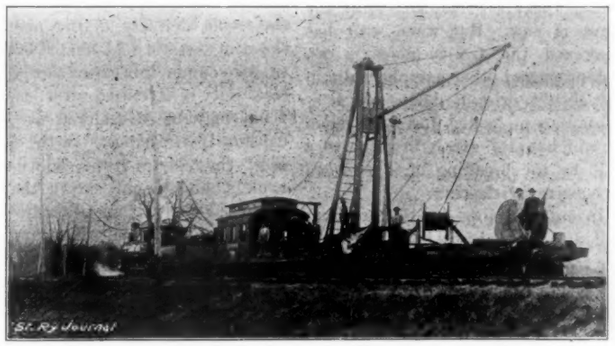


FIG. 2.—CONSTRUCTION TRAIN ON THE PENNSYLVANIA RAILROAD'S MOUNT HOLLY BRANCH.

The span wire for supporting the trolley is three-eighth-inch galvanized standard cable, fastened to five-eighth-inch drop forged eye bolts. The trolley wire is No. 00 hard drawn copper and was stretched by another construction train, composed of a tower car and engine. On the front of this car was a stand for the reels from which the wire was run up to the roller on top of the tower, and from there it was fastened to the span wire by loops of wire until the entire reel was run off. The slack was then taken up, after which the train returned and the insulators and ears were put in place.

The track is the same as used for the steam road with the exception that the joints are bonded on the outside of the rail and a supplementary wire is run along on each side, there being two supplementary wires.

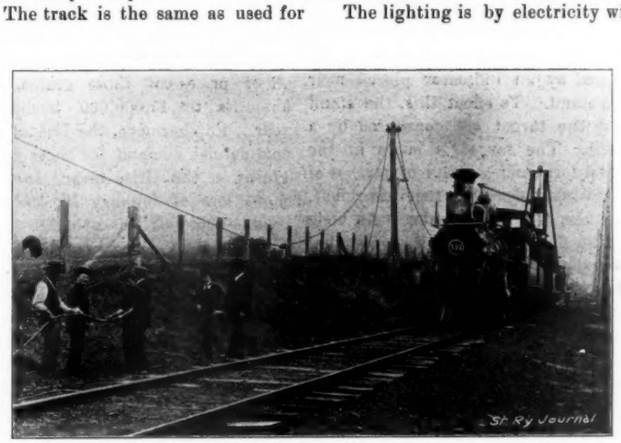


FIG. 3.—SPLICING FEEDER CABLES ON THE PENNSYLVANIA RAILROAD'S MOUNT HOLLY BRANCH.

The power plant is located at the Mount Holly terminus and consists of a Westinghouse direct-coupled generator and compound engine and a boiler of 300 horse-power capacity. There are three motor cars of sufficient power to draw standard Pennsylvania Railroad coaches for trailers and maintain a speed of from 45 to 60 miles an hour.

The motor cars are slightly smaller than the standard Pennsylvania Railroad coach, and have the following dimensions: Length of body in frame, 35 feet; length over platform, 43 feet 6 inches; width of car at sills, 9 feet 4 inches.

The interior finish is of Mexican mahogany, light in color, and the side and top ceilings are of handsomely figured white birch veneer, highly polished, but without a line of decoration. The beauty of the cars, therefore, aside from the delicate carvings and fancy moldings, is in the figure of the woods employed and the excellent finish they have received.

As it is the purpose of the railroad company to haul regular passenger coaches as trailers, the motor cars are equipped with the company's standard Janney platforms, couplers and buffers and have an end entrance for passage from one car to the other.

The lighting is by electricity with lamps along each side of the roof. The cars will be equipped with 22 Central electric heaters, one under each seat in the passenger compartment and two in the baggage compartment.

The cars are equipped with Westinghouse air brakes supplied with air pressure by a special compressor operated by a small electric motor. This motor is arranged to be cut out of service when the normal pressure has been reached in the reservoirs.

Electricity on Steam Railroads.

[*From the Chicago Times-Herald.*]

Suburban residents along the lines of the Chicago & Northern Pacific and the Chicago, Burlington & Quincy railroads will soon be able to ride to and from the city on swift-running electric trains. The Northern Pacific is about to substitute electricity for steam on its line and a new corporation is planning an extensive system of trolley lines along the Burlington to reach the towns of La Grange, Grossdale, Austin, Ridgeland, Oak Park and Lyons. The town board of Cicero has granted franchises for both enterprises and their backers assert they will be pushed to an early completion.

The improvement proposed by the Northern Pacific contemplates the use of electric power instead of steam over its entire system and is regarded by railroad men as one of the most important departures of years. This road will, in fact, be the first in the West to use electricity for its motive power. It is expected that the steam locomotives will be abandoned within four months. General Manager Samuel P. Ainslie on July 29 confirmed the report.

"I do not wish to discuss the matter just now," he said, when seen at his office. "I will say, however, that it is true we were granted an ordinance by the township of Cicero to operate our trains under a new system."

"When do you expect to make the change?" he was asked.

"Within four months."

"Will the change apply only to your suburban trains or to the whole line?"

"We expect to equip our entire service with the new power," said Mr. Ainslie.

"Have you received figures on your proposed plant, or have the contracts for its construction been signed?"

"No, no contracts have been entered into, but I would rather say no more about the matter at present."

The franchise granted by the trustees of Cicero, at an adjourned meeting, permits the Northern Pacific to run its trains through that town by electric power, which indicates the change which Mr. Ainslie admits is to be made. More than that, the Northern Pacific has already the basis for a mammoth electric power plant in its station at Harrison street and Fifth avenue. When that structure was erected it was planned with a view to ultimately using electricity for motive power in the place of steam. Not only were the foundations put in for a possible power house in the future, but many other features were embodied in its construction to make the conversion of a part of it into a power house a matter of few and quick changes. The plan to replace steam locomotives with electric power can, therefore, be thus carried out with a great saving of time and expense.

The trolley system along the Burlington line is to be constructed by a new corporation, known as the Suburban Electric Company. It filed a bond of $20,000 on July 29 as a guarantee that it would carry out the project on which it secured the right of way from the town of Cicero.

The franchise requires that the new system shall be completed within two years and put in operation, the penalty being a forfeiture of the grant.

Electric Launches for the Cotton States and International Exposition.

The ELECTRICAL REVIEW has already noted the fact that the Electric Transportation Company, of New York, of which General C. H. Barney is president, has secured the electric launch concession for the Cotton States and International Exposition, which opens at Atlanta, Ga., on September 18. Last Wednesday a party of 15 gentlemen accepted an invitation from General Barney to inspect one of these launches and try its practical qualities by taking a trip in it through the new Harlem Ship Canal. The launch is of exactly the same type as those used at the World's Fair, is 35 feet long, covered with an awning and is capable of developing a speed of 12 miles an hour. There will be eight of these in service at Atlanta, running over a course seven-eighths of a mile long. Two round trips will be made over this course for a fare of 25 cents. There will be five landings and two charging stations on the lake shore. These launches are built and equipped by the Electric Launch Company, of Morris Heights, N. Y., and this company, together with the Electric Storage Battery Company, of Philadelphia, will have interesting storage battery and launch exhibits in the boat house of the Electric Transportation Company at Atlanta.

The trip through the Harlem Ship Canal was a very enjoyable one. An excellent view of the work on the new speedway was had and the busy plant of the Electric Launch Company at Morris Heights presented an interesting sight.

LITERARY.

We have received "La Electricidad," by Eloy Noriega Ruiz, of Mexico.

The excellent "Electrical Engineering Leaflets," by Professors Houston and Kennelly, published by the *Electrical Engineer*, can now be obtained in bound form at $2 per volume for each of the three grades—elementary, intermediate and advanced. These leaflets present concisely and accurately the fundamental principles of electrical science. The elementary grade is intended for electrical workmen of all kinds who are not sufficiently advanced to undertake the other two grades. The intermediate grade is designed for students in high schools and colleges, while the advanced grade is for students taking advanced courses. The ELECTRICAL REVIEW Publishing Company will send these books, postage free, on receipt of price.

The report of the outages of the Cincinnati Edison Electric Company for July will show, it is reported, that they are much greater than any previous month in the history of the Edison company in Cincinnati. It is stated that the company for some reason or other is not pushing the work of public lighting.

A Pessimistic View of the Trolley.

[*From the Philadelphia Item.*]

The frequency with which reports appear in the papers of the tests of new motive power for street car propulsion shows that while the trolley is being introduced everywhere, it is not regarded as being either a permanent or a satisfactory system.

Independent of its dangers, the trolley works satisfactorily while the plant is new. But when wear has weakened the trolley poles, wires, fastenings and other paraphernalia in use, then a grist of delays and accidents can be looked for. A system in which every car is brought to a halt by the breaking of a wire can never give satisfaction.

Inventive genius sees the vexations and delays which are bound to mark the trolley system, and it is working to secure some more satisfactory street car motor. Years ago, when the cable was laid in this city, the claim was made that it was the method which was destined to become permanent. To-day the cable has entirely disappeared. It was a short-lived and costly undertaking. The trolley is less expensive, but its duration promises to be even shorter.

We wonder what system of street car propulsion the *Item* is interested in? The trolley has done more to benefit Philadelphia than any other modern invention.

Electric Target.

There has been tested recently, near Gratz, in Austria, an electric target invented by Felix Mauthner, an Austrian captain, and Fritz Figlovsky, engineer. This target presents the advantage of rendering unnecessary the presence of a man to indicate the hits. In fact, whatever the range, the target, as soon as it is hit by the projectile, gives a signal which is registered by an indicator placed near the stand. To effect this, the stand and the target are connected by a cable. The target is made in the usual form and consists of meshes of wire tolerably close together; it is, further, of a bright color. As soon as the figure or the wire rings that represent the upper part of a man's body are hit by a ball, the circuit closes and the bell placed near the stand is heard; this ringing is accompanied by a signal visible on the indicator. The apparatus, which is connected with the target, is placed underground and requires no care for its maintenance. According to the *Zeitschrift Fur Elektrotechnik*, the experiments with this target have given very satisfactory results.

In spite of Judge Speed's positive opinion that the telephone companies in Detroit, Mich., do not need ordinances, the council on July 23 devoted two hours to listening to oratory, and finally repassed both ordinances. The clause providing that all wires shall be placed underground within the mile circle was knocked out and the half-mile circle was named as the limit.

Static and Dynamic Discharge Potentials.

It is known that it is possible to get a spark between two conductors by two principal methods: First, by the static method, by uniting them to the two poles of an electro-static machine; second, by the dynamic method, placing them in communication with a wire traversed by a discharge. In the first case, by reason of the feeble delivery of the machine, the electro-static field created between the two conductors varies slowly; the electricity distributed over each of them may be considered as being constantly in balance. In the second case, the electro-static field varies rapidly and it is not shown that the electrical distribution is always a distribution of balance. Knowing this, M. R. Swyngedauw has considered the correctness of the following proposition: An exciter under certain physical conditions discharges for the same potential whether it is charged by the static or dynamic method. In other words, the static and dynamic discharge potentials are equal for the same exciter. The results of experiments conducted by him to this end have demonstrated the truth of the said proposition, which the author proposes to state as follows: If the discharge potentials of two different exciters are equal in the static charge, they remain equal in the dynamic charge.—*Revue Scientifique.*

The Passing of the Street Car Horse.

It has been estimated that electric railways have displaced in the United States no less than 275,000 horses, and the movement has not yet stopped. It is estimated by a Topeka paper that that many horses would require about 125,000 bushels of corn or oats a day. A decrease of 125,000 bushels a day in corn and oats consumption is enough to appreciably affect prices of those grains. It amounts to 45,000,000 bushels a year. Furthermore, the loss of this commercial demand for these coarse grains in the cities means an enormous loss of tonnage for the railroads—about 62,500 carloads.

The Carnegie Steel Plant.

The great Carnegie steel works at Homestead, Pa., cover 300 acres of ground, represent a developed machinery force of 80,000 horse-power, pay men five times the wages paid in Germany, turn out in a day more freight than is carried on the entire Boston & Albany system, and produce with 4,000 men six times the output of the Krupp works in Germany, which employ 12,000 men. All the fuel used is natural gas, but for minor operations a central station operates in various departments 390 electric motors.

Niagara Falls Power.

The second 5,000 horse-power generator at Niagara Falls was started on July 27 and is now under test. There was no hitch in the starting and the big machine is running satisfactorily.

Westinghouse Electric and Manufacturing Company.

[*From the Boston News Bureau.*]

Upon the occasion of the recent annual meeting of the Westinghouse Electric Company some half-dozen Boston people were present and inspected the new workshop with its new machinery, and later visited the Westinghouse air brake works and the Carnegie steel plant works at Homestead.

Among these visitors was the manager of the Boston *News Bureau*, and the impression made upon his mind by this trip to Pittsburgh was simply this, that the sooner all electric interests recognize that the Westinghouse Electric Company is now, so far as human foresight can arrange it, in an invulnerable position as respects competition, prices and workmanship, the better it will be for all electric interests, and Boston certainly represents the largest electric interests in the country, as it more largely, than any other city, furnishes the capital for various electric enterprises.

The Westinghouse Electric Company steadily developed its business in the old works at Pittsburgh until, before the 1893 panic, it had reached a business in volume of the rate of $8,000,000 to $10,000,000 per annum. Competition became keener and General Manager Bannister said to his directors: "Give me a new factory and I will save $20,000 per month in operating expense." The result is the new electric plant at East Pittsburgh, where under a single roof is now located the largest workshop in the world, with every labor-saving device and every economic arrangement that human ingenuity can produce.

At the power house coal or slack, costing 40 cents per ton, dumps from an elevated track of the Pennsylvania Railroad into great reservoirs which automatically feed five self-stoking furnaces generating in 10 boilers 2,500 horse-power, which through alternating electric currents and Tesla motors assist in turning iron, copper and mica into the 5,000 horse-power generators for the Niagara Falls power plant, or tiny electric motors into street railway motors or electric office fans, into all the various machinery of electric fields and armatures, converters and controllers; in fact, everything going to make up modern electric machinery. * * * If there are no further serious declines in the prices of electric apparatus, Westinghouse common should be receiving dividends within two years with continuation of present business activities and only an ordinary growth in the electric development.

OBITUARY.

Charles A. Bennett, Jr., manager of the Freehold Electric Light Company, died at Freehold, N. J., on July 24. He was interested in several fire insurance companies, was a member of the Lotus Club, of New York, and was prominent in democratic politics.

TELEPHONE NEWS AND COMMENT.

A telephone war is on at Grafton, W. Va., between the Bell company and the Standard.

The Tri-City Telephone Company, organized at Moline, Ill., four months ago, has given up the ghost.

The Standard Telephone Company has acquired the West Shore Telephone Company, of Kingston, N. Y.

Mr. W. F. Burns has been sent to Japan to organize and perfect the Standard telephone system in that empire.

The Missouri & Kansas Telephone Company is removing its overhead wires and placing them underground in the principal business streets of St. Joseph, Mo.

A telephone rate war is on at Frankfort, Ind., between the two companies. They offer to serve residences at $1 per month and business places at $2.

The Colorado Automatic Telephone Company has been incorporated at Colorado Springs, Colo. The company will introduce the Strowger system throughout the State.

A bill has been introduced in the Illinois Legislature to regulate telephone charges in that State. The bill fixes the charge for cities of less than 100,000 inhabitants at $36.

The Rocky Mountain Bell Telephone Company has completed its new line between Butte and Great Falls, Mont. All the large cities in the State now have long-distance communication.

As was expected, Mayor Pingree, of Detroit, has vetoed the ordinance granting a franchise to the Brown Loud Speaking Telephone Company, its fate now resting with the council, which has deferred action.

The Delaware & Atlantic Telephone Company may build a new line through Skippack, Lucon, Lederachville, Salfordville, Woxall, Sumneytown, Greenlane, Red Hill, Pennsburg and East Greenville, Pa.

The plant of the Capital Telephone and Telegraph Company at Sacramento, Cal., will soon be put in service. It has a capacity of 750 stations, local and territorial, and was installed, in spite of numerous delays, in 45 days.

A quarterly dividend of one per cent will be paid by check mailed to stockholders of the Erie Telegraph and Telephone Company August 19, 1895, that are of record at noon, Saturday, August 10. The stock books will be closed at noon, August 10, and opened Monday, August 19, 1895.

President James E. Keelyn, of the National Association of Telephone Manufacturers and of the Western Telephone Construction Company, was in Burlington, Vt., last week making arrangements to introduce a system of telephone exchanges, connecting both sides of the lake and extending to Montreal and Albany.

The Minneapolis, Minn, council committee on underground wires have decided to have all wires in the subway district placed underground by September 1. After that date they will instruct the wire inspector to cut down all wires remaining in sight within the limits specified by law. The aldermen say that they mean business this time.

The New England Telephone and Telegraph Company's new exchange building at Worcester, Mass., will be 30 feet front, 37 feet rear and 100 feet deep. It will be three stories high on a raised basement, 70 feet from the sidewalk to the highest point of the roof and 54 feet to the highest point of the wall. The material is brick and Stony Creek granite.

One of the latest discoveries in connection with the development and extension of the telephone business, says an exchange, is the result which it has had upon the railroad business and consequently upon the hotel business. It is no doubt true that much of the business that formerly required a trip to New York, Philadelphia or Chicago by Boston business men is now transacted by means of the long-distance telephone.

The secretary of the State Board of Appraisers and Assessors has been engaged in searching the records of the office of the Secretary of State for the purpose of getting the names and place of business of the many telephone companies in Ohio that have recently sprung into existence. All the companies came under the revisions of the Nichols law, but only six have made reports in compliance with the law. It is believed that there are not fewer than 50 of them in the State.

The interior block system of telephone wiring, which was inaugurated last Spring in New York city by the Metropolitan Telephone and Telegraph Company, is proving very successful. The system was described and illustrated in the ELECTRICAL REVIEW for April 10, 1895. There are now in operation under this system about 12 city blocks and 49 others are ready for the construction work to begin. In almost every instance the system meets the favor of the telephone subscriber.

THE HEINZE ALTERNATING CURRENT FAN MOTOR.

Heinze Alternating Current Fan Motor.

The Standard Thermometer Company, of Peabody, Mass., makers of the Upton arc lamps, are also the manufacturers of the Heinze alternating current fan motor illustrated herewith. It is a one-eighth horsepower motor with fan guard, speed regulator, carbon brushes, ball and socket adjustment for position, and 13-inch six-blade nickel-plated fan.

This motor can be connected to any alternating circuit, runs without noise and at three speeds—600, 1,200 and 1,500 revolutions. The motor is self-starting, self-oiling, sparkless and of high efficiency. The 52-volt motor uses three and a half amperes of current.

At Boone, Ia., on July 23, the Iowa Union Telephone Company announced that, in appreciation of the patronage of old subscribers, hereafter people who already have telephones in use will not be charged for anything until further notice. The old subscribers will have the telephones kept in good repair and not have to pay a cent for them.

STORAGE BATTERIES AGAIN TO BE TRIED FOR TRACTION.

The Fourth Avenue Surface Line in New York City Once More to be Equipped.

The ELECTRICAL REVIEW is pleased to be able to announce the consummation of negotiations which have been carried on for some months and which will result in the Fourth avenue horse railway in New York city being partially equipped with chloride accumulators by the Electric Storage Battery Company, of Philadelphia. President W. W. Gibbs left New York for Philadelphia last Saturday carrying with him a contract for the equipment of the Fourth avenue line, work to begin about October 1. In case the operation is successful, the contract provides that all the cars on the Second and Fourth avenues systems, which are controlled by the Vanderbilts, shall be similarly equipped.

Mr. Gibbs spoke as follows to a Philadelphia *Times* reporter:

This method of operating street railway cars, which is new in this country, will, I am convinced, completely revolutionize the business throughout the world. It is no longer an experiment; it has passed that stage, for the cars are now running successfully in Paris. The French Electric Storage Battery Company, which is controlled by the Rothschilds, has conducted a series of experiments in this direction, and is now satisfied it has the perfect storage battery car. We have the right to use its patents and improvements, consequently it will be unnecessary for us to conduct costly experiments, but to simply demonstrate the entire practicability of the scheme. This, we believe, we can do, and if we can, it means the early abandonment of the overhead and underground trolley system.

The ELECTRICAL REVIEW hopes to see the latest trial of storage-battery traction—the second on the Fourth avenue line, the Julien system being tried before—result in complete success.

Consolidation of General Electric Factories.

President Coffin of the General Electric is quoted as saying in relation to the consolidation of the General Electric Works: "There has been a change of feeling among all of us and we can see where we made our mistake in the first place in not having one large plant."

One of the Lynn stockholders says the division of the plant originally was to satisfy the Thomson-Houston and the Edison Electric stockholders as they desired to maintain their works separate. He further says that the General Electric Company has the refusal of power from the Niagara Falls Power Company, should they move near to Buffalo.—*Boston News Bureau.*

ELECTRICAL REVIEW

Published at 13 Park Row,
P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.

ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW." NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

BOSTON OFFICE:
H. G. TUCKERMAN, Room 29, 620 Atlantic Ave.
WASHINGTON OFFICE:
GEO. C. MAYNARD, 800 H St., N. W.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - - .10
Back Copies, each, - - - - - - .25

SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, AUGUST 7, 1895.

CONTENTS.

PAGE

Views, News and Interviews..... 71
Mr. Rodriguez's Address Wanted..... 71
Crompton & Company's Alternating Current Work..... 71
Electric Railway Notes..... 72
Electrical Equipment of the Mount Holly Branch of the Pennsylvania Railroad..... 73
Electricity on Steam Railroads..... 73
Electric Launches for the Cotton States and International Exposition..... 74
Literary..... 74
A Pessimistic View of the Trolley..... 74
Electric Target..... 74
Static and Dynamic Discharge Potentials..... 74
The Passing of the Street Car Horse..... 74
The Carnegie Steel Plant..... 74
Niagara Falls Power..... 74
Westinghouse Electric and Manufacturing Company..... 74
Obituary..... 74
Telephone News and Comment..... 75
Heinze Alternating Current Fan Motor..... 75
Storage Batteries Again to be Tried for Traction 75
Consolidation of General Electric Factories..... 75
Department Stores and the Electrical Supply Trade..... 76
Incandescent Lamps..... 76
Wall Street and the Electrical Stock Market..... 77
Telegraph Extension in Alaska..... 77
Baldwin Locomotive Works and Westinghouse Company Unite..... 77
General Notes..... 77
Special Announcement..... 77
Critical Condition of Mr. Tesla..... 77
Economical Design of Electric Light and Power Plants..... 78
The Business Situation..... 78
Canarsie Tries to Keep Out Electric Cars..... 78
High Speed on a Steam Railway..... 78
A Daily Newspaper Man at Niagara..... 79
Walter K. Freeman Rearrested..... 79
A Minister Accused of Fraud in Selling Pennock Stock..... 79
Block Signals..... 79
The Fyfe Automatic Releasing Rheostat..... 79
Cotton States and International Exposition..... 79
The Columbian Corliss Engine..... 80
Air Brake for Electric Cars..... 80
Personal..... 80
Electrical Interference..... 81
Electric Power in Factories and Mills..... 82
Electric Light Flashes..... 83
Advance Information..... 84
Electrical Patents..... xi
Brooklyn, N. Y., and the Trolley..... xi
Kindred Interests..... xii
Kind Words..... xii

INDEX OF ADVERTISERS.

COVER PAGES. PAGE

Abendroth & Root Mfg. Co., boilers..... xviii
American Electrical Works, insulated wire. i
Armington & Sims, engines..... xviii
Boudreaux Dynamo Brush Co., a new foliated anti-friction metal brush..... i
Bunnell & Co., J. H., dry batteries..... i
Columbia Incandescent Lamp Co..... i
Day's Kerite, insulated wire..... i, x
Goubert Manufacturing Co., heaters..... xviii
Greeley, E. S., & Co., electrical supplies.... xviii
Hampson, E. P. & Co., engines..... xviii
Interior Conduit and Insulation Co., Lundell dynamos and motors..... i
Law Battery Co., open circuit batteries..... i
Lombard Water-Wheel Governor Co..... xviii
Okonite Co., insulated wire..... i, xviii
Partridge Carbon Company, motor and generator brushes..... i
Phœnix Glass Co., globes and shades..... i
Rhode Island Tool Co..... xviii
Safety Insulated Wire and Cable Co..... i
Standard Underground Cable Co..... i
Stirling Co., water tube boilers..... xviii
U. S. Telephone Construction Co., "M. & B." telephones..... i
Western Telephone Construction Co., telephones..... xvii
Westinghouse Electric & Mfg. Co..... ii
Weston Engine Co., engines..... i

INSIDE PAGES.

Allen, L. B., soldering sticks..... xii
American Bell Telephone Co..... xv
American Electric Telephone Co., long-distant telephones..... xiv
American Storage Battery Company..... xiv
Automatic Electrical Specialty Co..... vi
Baillard, E. V..... 84
Bain, Forée, electrical and mechanical engineer..... xi
Baker & Co., platinum..... xiv
Baxter, H. E., & Co., electrical supplies.... x
Belden Machine Co., drop forging..... xii
Benjamin, Geo. H., patents..... xi
Bickford & Francis Belting Co., leather xvi
Boynton Multivolt Battery Co..... ix
Bradbury-Stone Electric Storage Co., storage batteries..... xi
Brill, J. G., Co., railway cars..... xiii
Brixey, W. R., Day's kerite wires and cables. x
Brush Electric Co., arc lamps..... vi
Bubier Publishing Co..... ix
Central Electric Co., okonite wire, etc..... iii
Chisholm, A., & Co., commutator compound xi
Colgate Company, Geo. L., lightning arrester..... xi
Connecticut Pipe Mfg. Co..... vi
Crefeld Electrical Works, telephone cables. xii
Crocker-Wheeler Electric Co..... 83
Cutter Electrical and Mfg. Co..... xvi
Darlington, F. W., consulting engineer..... xvi
Denny, J. T., & Co., octagon pine poles..... xi
De Veau & Co., telephones..... xiv
Dixon, Jos., Crucible Co., belt dressing..... xv
Dudley Electric Manufacturing Company, individual telephone signal..... xiv
Duval, W. S., Jr., patents..... xi
Dyer & Driscoll, patent solicitors..... xi
Eddy Electric Mfg. Co., Eddy generators... xiii
Electric Launch Co..... xvi
Empire China Works, porcelain specialties. xiv
Euler, H. C., mother-of-pearl..... xi
Faraday Carbon Co., carbons..... ix
Fleming, W. H., woven wire dynamo brushes..... 84
Fort Wayne Electric Corporation, "Wood" ammeters..... v
General Electric Co., monocyclic system... viii
Globe Electric Construction Co., general contractors..... xvi
Globe Electric Light Co., incandescent lamps..... vi
Globe Metal Works, refiners of platinum.... xi
Harrisburg Foundry & Machine Co., Harrisburg ideal engines..... v
Hooven, Owens & Rentschler Co., electric railway and electric light engines..... iii
Huebel & Manger, table push..... 84
Independent Electric Co., fuse wire..... xii
International Correspondence Schools..... ix
Lane & Bodley, street railway engines.... iv
Lehigh Valley Creosoting Co., creosoted lumber..... xi
Lozier, H. A. & Co., Cleveland bicycles..... xi
Marshall, Wm., condensers..... 84
McIntire, The C., Co., connectors and terminals..... 84
Metropolitan Chandelier and Electric Supply Works..... 84
Metropolitan Telephone and Telegraph Co.. xv
Moore, Alfred F., insulated electric wire.... xv
Morris, Tasker & Co., tubes, poles and fittings xii
National Telephone Mfg. Co., telephones.... xv
New England Engineering Co..... xiii
New Haven Car Register Co..... iv
New York Belting and Packing Co., rubber belts..... iv
New York & Ohio Co., Packard lamps..... vii
Ostrander & Co., W. R., supplies..... 84
Partrick & Carter Co., electrical supplies for housework..... xi
Pemsel, Friedr., electric light and battery carbons..... iii
Penberthy Injector Co..... xvi
Pennsylvania Street Railway Association meeting..... 84
Philadelphia Telephone Co, Blake transmitter..... xv
Phillips Insulated Wire Co., wire..... 83
Pope Manufacturing Co., columbia bicycle xv
Read, R. H., patents..... xi
Replogle Governor Works..... 83
Riker Electric Motor Co..... xvi
Rose Polytechnic Institute..... xi
Royce & Marean, electrical supplies..... xi
Safety Car Heating and Lighting Co..... x
Sanger, M. E., & Co., experimental and model works..... xii
Scott Electric Lamp Co..... ix
Self-Winding Clock Co., clocks..... xvi
Shaw, Harry M., lightning arresters..... xiii
Shipp, Jordan & Co., carbons..... x
Siemens & Halske Electric Co..... vii
S. K. C. Electric Co..... ix
Smith, Jas., Woolen Machinery Co..... xvi
Solar Carbon and Mfg. Co., carbon specialties..... xvi
Southgate, W. B., & Co., watchman's time recorder..... ix
Standard Electric Co., arc lighting..... xii
Standard Thermometer Co., arc lamps..... xiii
Stanley Electric Mfg. Co., S. K. C. two-phase system..... vii
Stanley & Patterson, electrical supplies ... vi
Stevens, H. L. C., photo-engraving..... iv
Stucky & Heck Electric Manufacturing Co. xvi
Syracuse Storage Battery Co..... ix
Telephone Franchise..... 83
Thayer Electric Co., electrical engineers.... xvi
Varley Duplex Magnet Co., magnets..... xv
Washington Carbon Co., Helios carbons... iii
Waterman, Chas. H., arc lamps..... ix
Western Electric Co., supplies..... x
Weston Electrical Instrument Co., measuring instruments..... x
White-Crosby Co., contracting engineers... xi
Wilkinson, W. H., automatic wiping device. xii
Worthington, H. L., electric signs, etc..... iv
Zogg, Nicholas..... 83

DEPARTMENT STORES AND THE ELECTRICAL SUPPLY TRADE.

It seems that the electrical supply trade will soon be called upon to recognize a serious competitor in the large department store. Already one or two such stores have exposed for sale electrical goods at bargain-counter prices. A big Chicago house whose name has hitherto been associated with dry goods has opened an electrical supply department of considerable magnitude. There you can buy, for instance, one or 1,000 incandescent lamps at 17 cents each and have your purchase delivered free in any part of the city or suburbs. A bell-hanger living on the far west side may write an order for electrical supplies on a postal card and the goods will be delivered free C. O. D. the same day. Or if his wife is going shopping, he may give her the list and she will order the goods for him. Thus he can make purchases at absolutely no expense.

Although we know of one or two manufacturers of electrical goods who have refused to fill the orders of department stores, thereby thinking to protect the regular electrical supply houses, the fact remains that if these manufacturers do not fill the orders others will. Some of the supply houses do not merit this consideration on the manufacturer's part, because they have been known to fail to protect the manufacturer. Then, too, from the manufacturer's standpoint, there seems to be no valid reason why he should not fill as many orders from the department stores as he can get. They are all cash buyers, and therefore their orders are desirable. The manufacturer in dealing with the regular supply house, on the other hand, seldom is able to effect a cash sale, but has to wait for his money from 30 days to six months. The small consumer in large cities would preferably deal with the department store, because, although he must buy for cash, he thereby gets a lower price and makes a further appreciable saving in having no cartage to pay for the delivery of his purchase. Some of the department stores make free deliveries within a radius of 100 miles, so that the buyer in small towns is placed on an equal footing with his city brother.

The department store has an added advantage over the regular supply house in that the items chargeable for rent, clerk hire, packing and other things are very small proportionately. A dry goods house can hire expert electrical buyers and salesmen just as readily as a supply house. The facilities possessed by the department store for doing business cheaply all militate to the ultimate advantage of the consumer and he, in the end, is the gentleman the manufacturer is after.

This discussion comes finally to include the question of credits, something of growing importance in the electrical business. The losses which manufacturers and supply dealers have sustained in giving long credits, which have usually ended in failures, probably amount to hundreds of thousands of dollars. Why cannot the electrical business, as well as any other, be run on a short time or a cash basis? There is no good reason except the precedent established by an unwise custom.

Finally, if the department store continues to expand, as it undoubtedly will, the electrical supply houses must find means to meet the new and serious competition. The first and most natural suggestion which presents itself is that the supply house take the same position as the department store—buy and sell for cash, depending upon a small, but certain, profit and a large volume of safe business. May not the first established "strictly cash" electrical supply house be a huge success?

INCANDESCENT LAMPS.

The incandescent lamp market is in a most unsatisfactory state both for the manufacturer and the consumer. The principal trouble seems to be that the consumer has not yet realized the situation. Prices for lamps are at the lowest point ever known. They range from 22 cents down to 14 cents with a rebate for returned bases. It is to be regretted that one of the largest manufacturers in the United States sees fit to sell lamps at a price below that recognized by the trade as the cost of a good lamp. It is accepted as an axiom in the lamp business that no manufacturer can make and sell a good lamp lower than 20 cents each in quantities and make a profit on the transaction. The manufacturer seems to be waiting for the consumer to realize that quality is the prime consideration in an incandescent lamp, beside which a few cents difference in first cost cuts no figure. Economy of operation coupled with long life are more to be desired than a low priced lamp which rapidly decreases in candle-power and finally breaks down at half the normal life. As the ELECTRICAL REVIEW has often remarked, there is no better application of the old saying "quality tells" than in the lamp business. Many of the lamp manufacturers are expecting the buying public to soon realize these points. The sooner the better for both the interested parties.

Wall Street and the Electrical Stock Market.

The stock market of the week has been reactionary in tendency. The bull move of last week culminated on Monday and was followed by realizing sales in the leading active stocks, and some little attempt to work up the specialties on existing short interests. On Friday the engagement of over 2¼ million dollars in gold for export caused a cancellation of buying orders placed by interests who thought the decline had gone far enough and resulted in an all-around drop in prices. There was a slight reaction towards higher prices on Saturday. The outward movement of gold is entirely logical and indicates that the syndicate does not care to sell any more exchange bills at current figures. However, it stands back of the Treasury and will make good any withdrawals from the reserve. Knowledge of this fact rather tempered the bearish effect of the exports. The business situation has changed only for the better. Higher prices in a number of staples were recorded, while there was no decline in any commodity except coal.

The continued advance in copper is a point of great interest to the electrical industry, both as it directly concerns operations and as it shows a development far in excess of previous estimates. The price of lake copper now is 12 cents. In March it was 9½ cents. The productive capacity of this country is as great as it ever has been, and the advance in price will stimulate an additional output. Good judges of the market state that a revival of the electrical business has been responsible for the gain thus far, while they look for additional improvement that will at least keep up the price to its present figure. They say that the next departure will be in the way of equipping steam roads with electricity and that this will involve use of the metal beyond the present productive capacity.

Electrical stocks were very quiet and without especial feature. General Electric closed the week at a loss of about ½ point on small transactions. This was due to the declining tendency of the general market. I learned that no definite decision has been reached by the management of the company as to whether it will remain at Schenectady or move to Buffalo.

Some little investment demand existed for illuminating bonds. The Edison Company of New York consolidated 5's sold at 103½. The old issue was quoted at 109½. The Brooklyn first 5's sold at 111¾.

The most pronounced development in electrical stocks during the week was the improvement in Electric Storage Battery on buying, by New York interests based upon important contracts made in different parts of the country. The stock advanced from 29 bid to 40 paid and then reacted slightly. It is asserted that a deal has been made with the Burlington system, which contemplates using electrical motors to be worked by storage batteries on some of its branch lines. The Lawrence, Mass., Electric Lighting Company has contracted for some of its batteries. Almost every week there are similar reports showing that the company's apparatus is being readily taken up by concerns who either use or who contemplate the use of electricity.

In a conversation with an executive official of one of the leading telegraph companies, who did not wish his name to be used, I learn that the improvement in business which is reflected by an increase in banking house clearances and railroad earnings and advancing prices, and which in volume is just now as great as it was in the banner year 1892, is being directly reflected in earnings of telegraph and telephone companies. In his opinion these concerns from this out will show much greater earnings and will permit of extensions and betterments which were contemplated before the panic. He cites as an example important improvements which Western Union has decided upon. He says there is a natural increase in the telegraph and telephone business which amounts from 10 to 25 per cent per year. During 1893 and 1894 this did not take place and he says that it is but logical to assume that much of it will come in the 12 months starting July 1.

In the Boston market, Bell Telephone declined from 199 on Monday to 195½ on Saturday. Erie Telephone was unchanged at 58. New England telephone advanced 2 points on Tuesday and later lost its gains, closing at 88. The strength in Westinghouse common continues. The bid price was 36½ and the asking figure 37. The preferred was quoted at 64 and 64¼. BAIN.

New York, August 3, 1895.

Telegraph Extension in Alaska.

It is reported that the Western Union Telegraph Company is about to take possession of the abandoned telegraph line extending through British Columbia, started 30 years ago to run to Europe via Behring straits and Siberia. It is proposed to rebuild the old line and extend it north of Forty Mile creek on the Yukon, and run branch lines to Sitka and Juneau, thus putting Alaska in touch with the world.

John W. Mackay, of the Postal Telegraph Cable Company, left Seattle, Wash., on July 27, on the steamship "Queen" for Alaska. He is accompanied by C. R. Hosmer, general manager of the Canadian Pacific Telegraph Company, and it is believed his visit north has something to do with the early construction of a telegraph line to Alaska from Vancouver, B. C.

The incorporators of the Consolidated Traction Company, which, it is said, was formed to control all the electric railways of Pittsburgh, are reported to be getting down to active work.

BALDWIN LOCOMOTIVE WORKS AND WESTINGHOUSE COMPANY UNITE.

ELECTRIC LOCOMOTIVES TO BE MANUFACTURED AND BOTH PLANTS RUN.

Philadelphia business circles were surprised on Monday of this week by the announcement of the consolidation of the Baldwin Locomotive Works and the Westinghouse Electric Manufacturing Company. By the agreement the two companies will hereafter work as one, yet both plants will be retained as they are at present, extensions being made as the business warrants.

The Baldwin Locomotive Works were founded by Mathias W. Baldwin in 1831, and they now cover 14 acres of ground, and there are about 5,000 men employed. The capital of the firm, the enterprise never having been incorporated, is placed at $5,000,000. The Westinghouse company has a capital of $10,000,000.

Mr. George Westinghouse said it was not in any sense a consolidation, but a union of interests for the more economical and improved manufacture of electric locomotives, the demand for which was felt more and more every day.

Secretary Terry, of the Westinghouse company, stated that there was a constant inquiry for electric locomotives, and although it could not be said that there was a market now, the market would be found as soon as the engines were ready. The recent successful operation of electric locomotives had convinced the members of both companies that a union of interests for working purposes would be advantageous and the contracts had just been signed.

GENERAL NOTES.

The annual report of the Boston Electric Light Company for the year ending June 29, 1895, shows total income, $610,265; operating expenses, $411,449; net, $198,815; less interest on bonds and loans, $31,845, and dividends, $136,000, leaves surplus, $30,889; total balance to credit profit and loss June 29, 1895, $372,611.

President Rossiter and Secretary Williams, of the Brooklyn Heights Railroad Company, are having built for use on the 200 or more miles of trolley roads under their management in Brooklyn, N. Y., a number of elaborate open cars, with many special features of comfort and convenience, for the use of trolley excursion parties. Six special closed cars, elaborately illuminated, will be built for the use of theater parties.

In the death of Mr. E. K. Wright, president of the National Park Bank, of New York city, the financial world lost one of its ablest members. His bank is one of the greatest in this country, and so well organized and managed that, although the officials will feel his death keenly, the institution will not suffer, but will continue in its ably conducted channels as of old.

SPECIAL ANNOUNCEMENT.

The demand for good men in the many branches of electrical work is again noticeable.

The ELECTRICAL REVIEW desires to aid all who are out of employment in this field, and will publish from now until October 1 all announcements of "Positions Wanted" at *one-third* the regular rate.

Our usual charge is $1.50 for each announcement; one-third will make the cost 50 cents.

Answers may be requested in the care of the ELECTRICAL REVIEW office and will be promptly forwarded.

Critical Condition of Mr. Tesla.

[*From the London Electrical Review.*]

Our readers will be grieved to learn, on the authority of Mrs. Bloomfield Moore, in the *New Science Review*, that Mr. Tesla is in a very awkward position. It is a number of days, says this gifted woman, since Tesla crossed the border line of the circle in which other electricians are working, but he still remains in the interatomic field of research, unmindful of the triple conditions that govern electricity in the relation which it sustains to the first order of the "liminous." This is sad enough, but we have yet to tell the worst. It appears that by reason of Tesla's wicked neglect of Keely's system of resonance he has missed the chance of hobnobbing with electrical phenomena in the sympathetic field, and is standing on a bridge which connects the primary two-thirds of the electric stream—the subdominant current with the dominant. What a fearsome post is his! But the consequences of his folly will still pursue him, and even though he may hook on to the dominant, he will still be subserved to the terrestrial neutral far in the rear of sympathetic union to radiating celestial outreach, the connecting link of which exists in the interluminous. Mrs. Moore says, further, that even in the event of Tesla's salvation, he will not have reached the compound interetheric. If such be the case, we should advise Mr. Tesla to climb down at once from his supradominant hypoluminous outreachment, and no longer seek to attain the interatomic realm, but to content himself with hard pan. The sting of Mrs. Moore is, however, in her—well, our readers will understand. Given a prompt cash settlement, and Keely will plank down all his secrets, and tell us how we may make a 10,000-ton ship float like a gossamer in the Summer breeze. (Our readers will kindly take notice that this last poetic vein is our own, not Mrs. Moore's.) Failing this settlement they will die with Keely. The cosmical law of sympathetic association will then be lost to an ungrateful world, and Keely will rise on his vibratory mediums into the far outreach after a life spent in overreaching, amongst others, Mrs. Moore.

Economical Design of Electric Light and Power Plants.

Mr. George W. Blodgett, electrician for the Boston & Albany Railroad, recently sent the following communication to the *Railroad Gazette:*

The following limited investigation of a point mentioned in the discussion by Mr. Geo. H. Barrus of a paper on coal consumption, read at a late meeting of the Boston Society of Civil Engineers, opens up a subject which deserves a larger consideration than it has yet received.

The arrangement of one of the most recent electric light stations (or electric current stations, as they would be now more properly called) in a large city brought a somewhat new principle into special prominence. It has long been observed that, owing to the fluctuating demand for electric current from a central station (which, though varying between wide limits, yet follows a somewhat definite law), the average consumption is very much less than the maximum capacity of the station, which, however, must be equal to the heaviest demand to be made upon it, even though this demand is but for a very short time.

This means that the equipment of such a station with boilers, engines and dynamos must be very much larger than would suffice for a steady load equal to the average demand, and that this portion of the plant must lie idle for a large proportion of the time. The earning capacity of this part of the machinery is, therefore, very small.

This fact alone accounts for the failure of many electric lighting companies to pay any dividends, since the larger part of the plant is for the most of the time unproductive.

Very serious study has been given to the problem how to increase the earning capacity of such a station, and partial success has been attained in several different directions. Were there no limiting conditions, the remedy for the difficulty would be simple and effectual, in one or another of the following ways, viz.:

1. Distribute the demand for electric current uniformly over the 24 hours of the day, by transferring the excessive requirement to some portion of the day where now there is power to spare.

2. Accumulate a surplus when the plant is not taxed to its full capacity, to be drawn upon during the hours when the demand exceeds the limit of the average supply.

3. Furnish the difference between the average and the maximum requirements from a part of the plant costing less than that portion which is constantly in use.

The first two suggestions would admit of the use of a generating plant of smaller capacity than is now employed, and the third, while requiring as large an outfit as at present, would cheapen the cost of that portion of the current included between the average and the maximum output, that is, of the portion which is produced at great expense, if not at an actual loss, because now used only a small portion of the time in the busiest hours of the day.

It is manifestly impracticable to carry out the first proposition. In the majority of cases the use of the electric current could not be transferred to any other than the times it is now called for, the principal and largest requirement being for lighting, and this almost entirely by night. In a residential district, where the lighting begins when darkness comes on, the heavy demand ceases at from 10 to 12 o'clock P. M., with a small consumption through the whole night.

In a mercantile district, however, there is a demand both by day and by night, in stores, and, to a degree, in manufactories, for day lighting, beginning at from seven to nine o'clock in the morning, when such buildings are opened, and lasting until they close at night, usually from five to seven o'clock, after which very little current is required (except for street lamps) until the hour of opening next morning.

In a manufacturing district some lighting is required during the day, but within a few years there has developed a considerable and constantly increasing demand for electric current to furnish power for various purposes, where formerly hand labor was used, or where small, and, therefore, very uneconomical, steam engines were employed.

The great convenience, safety, ease of application and frequently considerable saving of expense when electricity is used, are advantages which, when they are thoroughly appreciated, will lead to much more extended and varied applications of electricity in manufacturing processes. This is especially satisfactory to a company supplying electric current, and such use is to be encouraged by all legitimate means, as it calls for the current at a time when the demand for lighting is at a minimum, and when, therefore, the proportion of the cost to the output is largest. The steadiest and most satisfactory load for an electric station is usually all-night street lighting. The next best is probably street lighting where lamps burn till midnight, while still less desirable are street lights which are burned only when the moon does not shine, or is obscured by clouds.

In some stations electricity is required for all the uses enumerated above; the net result is a more even demand than where some of them are absent, but still very far from uniform.

There are three ways in which a station may be equipped for furnishing electric current, viz.: 1, with one or more generators of large size; 2, with a number of smaller units, which may be coupled together when necessary, or 3, by a combination of large and small machines.

The very great difference in the consumption of coal per horse-power makes the larger engines and generators far more economical than small ones, while their high cost adds greatly to the initial outlay.

In favor of the smaller machine is the less first cost, and the convenience of being able to shut off the machinery a little at a time as the demand for the current falls off, which is partly, sometimes completely, offset by the less cost of current generated by a large machine, driven by the most recent type of triple expansion or compound-condensing engines, with jacketed steam cylinders, which produce a horse-power with about one pound of coal per hour, while small engines frequently require six to eight pounds. The choice reduces, then, to this:

We may pay a large sum for a generating plant which will enable us to produce electricity cheaply, a considerable portion of which must lie idle a large part of each day, or buy an outfit at less cost, and very largely increase the consumption of coal.

In some stations a generating plant smaller than the maximum demand has been made adequate by supplementing it by a large storage battery to be charged by the surplus current which can be obtained when the requirements are less than the station can supply, and to be drawn upon during the hours when the demand is excessive.

This plan is worthy of much greater consideration than it has yet received, as it allows all the current used to be generated by a minimum amount of apparatus of the highest efficiency, running under the most economical conditions.

Another method is to furnish the largest and most constant part of the current from very efficient apparatus, and meet the extraordinary demand by the use of less costly, but less economical, machinery.

Here seems to be the key to the soundest application of this principle, viz.:

Determine what will be the average and steady load on the station during the time when current is required, and purchase a plant of the most economical and efficient type sufficient to carry this load, together with a liberal allowance for the growth of business, and supply the remainder of the current from machinery of low cost, run so much of the time as is necessary to meet extraordinary demands. The limit of economy of this proposed arrangement is reached when the interest per annum saved in the less cost of the plant just equals the extra cost of fuel per year.

There is still room for the exercise of sound judgment as to the best size and type of machinery and the proper arrangement of the station, and especially as to the proportion of the load which should be borne by each type of apparatus, and great care should be exercised not to spend too large a sum for apparatus which cannot be operated with economy, bearing in mind that the cost of installation is paid once for all, but the running expenses go on continually. When the two parts of the plant are in their proper proportions, the cost of producing electricity will be at a minimum and the profits of the station the greatest, so far as they are affected by this particular question.

The foregoing considerations apply to every station supplying electricity for lighting or power or for running street cars, or even to the pumping of water or the supply of steam power where the demand is irregular, but must be promptly met when it comes.

The ideal arrangement for an electrical supply station would seem to be a generating plant of the most economical type supplemented by a storage battery of sufficient size to carry that part of the load which exceeds the capacity of the station during all the hours such extra demand exists, and absorbing, during the hours when the outside load is light, the surplus which the plant can furnish, supplemented by a small amount of low cost machinery for the maximum demand during the heaviest portion of the day. Under such an arrangement it would sometimes be possible to shut down the generators altogether when no great quantity of current is required, and draw upon the storage batteries, thus still further decreasing operating expenses. This scheme would furnish a maximum supply current at a minimum cost.

In some places considerable business can be done in the sale of exhaust steam for heating purposes. In this case a regular and tolerably uniform supply would probably be desired, and here the storage battery plan would be very favorable.

The Bell Telephone Company of Philadelphia wants to place its wires underground but seems to have discovered that the city ordinance only permits it to remove its overhead wires, no provision being made for doing subway construction.

The Business Situation.

The business situation continues to exhibit an increasing improvement with rising prices and an expansion of trade in the various industrial fields. The iron and copper markets are in an especially good condition. In the great Pittsburgh iron industries more men have been at work during the past week than at any time prior to the panic of 1893. Copper continues to make a steady advance, one of the principal causes being the increased demand from the insulated wire manufacturers and from the builders of electric railways. The textile industries show a gratifying increase in the number of mills established during the first half of 1895 as compared with 1894. In general the commercial outlook is improving all the time. If the harvest is as bountiful as all signs indicate, it will have a most beneficial effect on Autumn trade. Taken all together the outlook for general business in the Fall is most encouraging, and there is no reason to doubt that the electrical trade will participate in the revival. The wise man will not be caught napping.

Canarsie Tries to Keep Out Electric Cars.

Last Friday the managers of the Brooklyn, Canarsie and Rockaway Beach Railroad attempted to build a fence around the village of Canarsie, with the object, it is said, of preventing the Nassau Electric road of Brooklyn, N. Y., from landing its passengers in Canarsie. The attempt proved a failure and brought about a battle which resulted in three arrests and a victory for the new electric railroad. While the steam road charged a fare of ten cents from East New York to Canarsie the electric road cut the rates to five, which included a trip to and from the Williamsburgh ferries.

High Speed on a Steam Railway.

A press dispatch from Wilmington, Del., on August 4, said that in taking a train on the Pennsylvania Railroad to Washington the day before, Engineer George Fredericks, with engine No. 92, made the run from Louden Park to the Navy Yard, a distance of 35½ miles, in 33½ minutes. The five and one-tenth miles between Landover and Anacosta were covered in three minutes, a rate equal to 102 miles per hour. This, it is said, beats the record for rapid railroad travel for that distance with a train. Engine No. 92 is a new one, recently sent from the Altoona shops.

Mayor Strong, of New York city, was reported last week as saying that he had about made up his mind to sign the resolution providing for the sale of a franchise for a street railway system covering about 27 miles of street in the territory above the Harlem. This resolution was adopted by the Board of Aldermen on the application of the company known as the People's Traction Company, of which Francis C. Wilcox, a large property owner in the territory through which the new road will run, is president.

A Daily Newspaper Man at Niagara.

Mr. H. L. Bridgeman, business manager of the Brooklyn *Standard Union*, in the course of a special letter to his paper, speaks as follows of new Niagara Falls:

The old days of Niagara rapacity and piracy have gone forever. A sense of peace, order and quietness prevails; the hackmen are civil and accommodating; the hotels, of which the renewed and enlarged International is easily first, are equal to any; and the whole city, year by year, gains in the visible evidences of solidity, of independence and of self-respect, which inspire confidence, induce longer and more frequent visits, and make Niagara, not for an hour or a day, but for a season. The electric developments now going on, beneath and upon the surface, are upon a scale so broad that it is hardly possible to reduce them to definite statements and details. The best idea, perhaps, can be obtained from an observation by a citizen, that gentlemen who prefer to "stay in," rather than to "get out," with $10,000,000 profit, as they might at the present time, evidently intend to see the matter through to the end. Electricity will be shortly delivered in Buffalo in sufficient quantities to materially affect the use and the cost of steam; it will dispense almost entirely with it in Niagara. So rapidly are the developments, however, in the application of electricity to the arts and forces of life, that one is hardly able to speak of the revolution which is sure to come. The one great fact is demonstrated, that power almost beyond calculation is available, and that when the forests are all gone, the coal all burned, and nothing remains but electric energy as a source of light, heat and power, a practically inexhaustible supply is here at Niagara awaiting only transmission. The city which is to arise by these Falls will be not less attractive, because work of man, founded upon and crowning the great wonder of nature. The environment is most inviting, and with the generous action of the State and the Dominion, reserving a broad park directly through the center of the future metropolis, on each side of the great river, a city is here to be, which will be, not only in itself a central factor, but one of the wonders of the Twentieth Century. One day at Niagara exhausts neither the scenic, historic nor practical aspects, but in each it is full of reward. The observation of that profound philosopher, Chesterfield, that "he didn't care to go fishing, because he had been," has no application to him who would visit and revisit Niagara. The more it is seen, the more it is admired; and year by year it discloses new attractions and greater possibilities. The Empire State of the next century will have at its western portal a busy, thriving and new created city, which may be no mean competitor to its metropolis at the gateway of the Hudson.

Walter K. Freeman Re-arrested.

Walter K. Freeman, who is known to many electrical people, was re-arrested in New York city on July 30, charged with criminal assault upon Sarah E. Work, 15 years old, of New York. Freeman was arrested for the offense last September and held in $2,500 bail in the Jefferson Market Police Court. He was indicted and jumped his bail. Recorder Goff committed Freeman to the Tombs in default of $5,000 bail.

A Minister Accused of Fraud in Selling Pennock Stock.

On July 24 Rev. Bryant McLellan, pastor of the Milford Baptist Church, was arrested on the complaint of Perley P. Field, of Milford, for alleged fraud in the sale to the latter of $500 of Pennock electric stock. The arrest was made in the office of the Pennock outfit in Boston.

The complaint states that Mr. McLellan on June 24 falsely pretended to the complainant that the stock of the Pennock Battery, Electric Light and Improvement Company was of the market value of $5 per share and that the stock had been withdrawn from the market by the company, by means of which statements Mr. McLellan obtained from the complainant the sum of $500. In fact, the complaint alleges, the stock was not of the market value of $5 per share and it had not been withdrawn from the market by the company.

A Boston paper recently reported the sale of 500 shares of this stock at eight cents per share. An official of one of the local banks estimates that $20,000 of Milford money has been invested in the stock.

Block Signals.

In the "Four-Track Series," No. 17, Mr. George H. Daniels, general passenger agent of the New York Central & Hudson River Railroad, has published a most interesting story under the title of "Block Signals on 'America's Greatest Railroad.'" The letter press and illustrations in color are unusually fine. The technical description is by Mr. John P. O'Donnell, a member of the American Society of Civil Engineers. The New York Central has spent more than $1,000,000 in equipping its lines with the safest and most complete system of block signal devices for handling trains known to railway science. The block signal system is a mystery to the average man and we can imagine no more instructive or interesting pastime than to take a trip over the New York Central road, with a copy of this book in hand, and observe what is to be seen of the practical working of the block signal system. Six cents in stamps, sent to Mr. Daniels' office in New York city, will secure a copy of the book.

The Fyfe Automatic Releasing Rheostat.

Motor-starting rheostats have become very important features in the electrical line, as the Board of Underwriters, as well as city fire inspectors, not only require their use wherever motors are used, but stipulate that they shall be made to open the motor circuit automatically and be fireproof. It is also required that a double-pole switch be placed between the main wires and the rheostat, and that this switch must always be opened after the motor is stopped to avoid the danger of fires from grounds, lightning and the like. This latter requirement has resulted in more or less disaster and annoyance, as the error is frequently made of closing the armature circuit before closing the switch or field circuit. Thus the full force of the current is suddenly thrown on the motor. Such mistakes result in the instantaneous short-circuiting of the system and blowing of the fuses at the power station, as they may be already loaded nearly to their full capacity, thereby temporarily disabling the entire system.

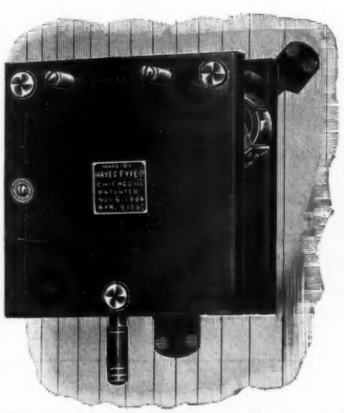


FIG. 1.—AUTOMATIC RELEASING RHEOSTAT WITHOUT SWITCH.

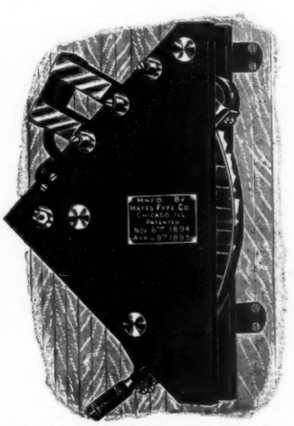


FIG. 2.—AUTOMATIC RELEASING RHEOSTAT WITH DOUBLE-POLE SWITCH.

A device has been invented by John C. Fyfe, of Chicago, to meet the requirements of the underwriters and comply with the city inspection rules, at the same time obviating the possibility of such mistakes as those alluded to. This device is shown in the accompanying illustrations. It is manufactured by the Hayes-Fyfe company, 360 Dearborn street, Chicago. Mr. Fyfe, the inventor, is well known in electrical circles, having been engaged for the last 14 years in practical experience in the art.

The primary object of the Fyfe motor-starting rheostat is to overcome the objectionable features referred to, and this is accomplished by providing a double-pole switch through which the circuit must be closed before the resistance and armature circuit can be closed. The revolutionizing feature of this improvement, however, lies in its being automatic in its release from any point of contact of the resistance, and the contacts being of iron, of great surface, are magnetized by being wound with the resistance itself. The resistance is insulated by an absolutely fireproof porous insulation, and is consequently perfectly ventilated but rigidly supported in every turn of the coils. Upon suspension of the current from any cause whatever, the multiplicity of rolling iron contact disks, carried by the contact arm at any point where they have been allowed to remain, become instantly released and fall by their own weight, not only opening the armature circuit but positively forcing open the double-pole switch after the initial magnetic resistance contact has been passed. It will thus be seen that the motor may be operated at any required speed or power, and be automatic in release from that point. The supporting of the fireproof ventilating resistance and the working parts within plates of slate, which are supported by thoroughly insulated iron feet, is sufficient proof of safety in operation. The liability to wear of the wearing parts of the device is reduced to a minimum.

Cotton States and International Exposition.

The work at the grounds of the Cotton States and International Exposition at Atlanta, Ga., is being rapidly pushed to completion. Nearly all of the companies' buildings are completed, and those still unfinished will be ready for the installation of exhibits in a short time. It is now less than two months before the gates will be thrown open, and work is being rapidly pushed. The force of laborers has been increased, and there is no longer any doubt that, by the 18th of September, the Exposition will be ready for the rush of visitors on the opening day. Exhibits are beginning to come in, and the work of installation will be pushed from now on to the opening day. Arrangements have been made with the telegraph companies by which a wire will be run to Gray Gables, and President Cleveland will touch the button at his Summer home on Buzzard's Bay, which will start the great Fair in motion.

For the past 30 days a perfect deluge of water from the Atlanta City Waterworks has been pouring into the lake at Piedmont Park, the site of the Cotton States and International Exposition at Atlanta, and in a short time the immense basins which make up the two lakes will be filled with crystal water. The lake extends for nearly half a mile along the foot of the immense central plaza, skirting many of the principal buildings. It will be covered with gondolas and electric launches, and will be one of the features of the Exposition. In the center of the main basin will be the electric fountain, designed by Mr. Luther Stieringer, the constructor of the electric fountain at the World's Fair. This fountain will throw a solid stream of water 300 feet high in the air, and innumerable sprays and side jets, brilliantly illuminated from below the surface of the lake by electric lenses, will add to the gorgeous beauty of the fountain.

The Columbian Corliss Engine.

The Lane & Bodley Company, Cincinnati, O., makers of the Columbian Corliss engine, are among the oldest and most reliable engine builders in the West. The Columbian engines compare favorably with the best of the Corliss type in design, material and workmanship. They are built by first-class workmen in a new shop equipped with the best tools, devoted solely to these engines.

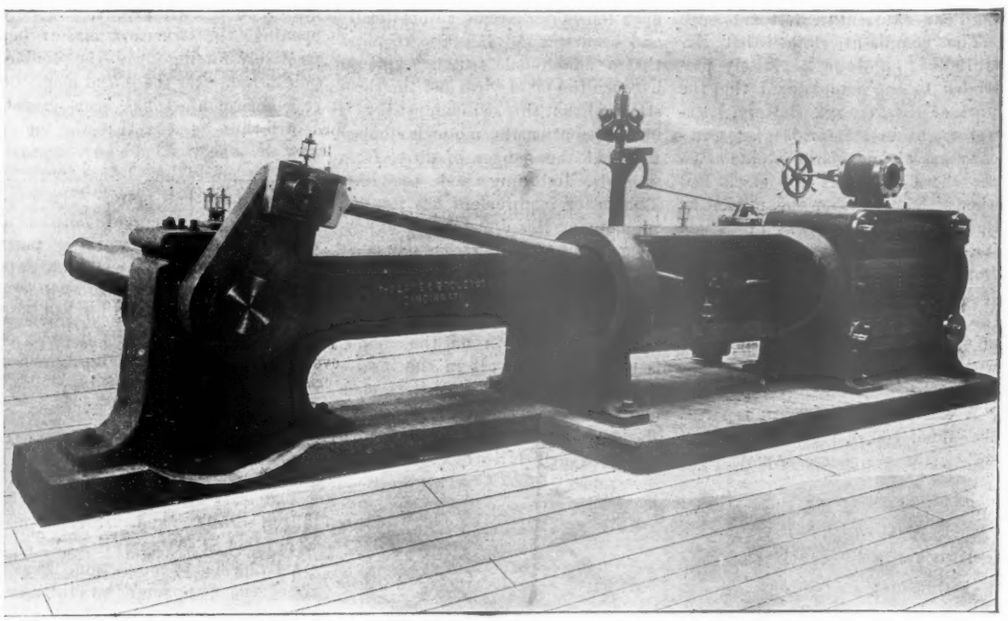


FIG. 1.—CRANK SIDE OF 22-INCH X 48-INCH COLUMBIAN CORLISS ENGINE, RIGHT HAND.

The leading features which make the Corliss type of engine economical are:

First—The use of four valves—two steam and two exhaust—so placed as to reduce clearance to a minimum.

Second—The use of a rotating valve, capable of being cheaply fitted and maintained, of being easily moved and conveniently operated by mechanism entirely outside of the steam space.

Third—The use of a wrist plate, caused to oscillate by a single eccentric, and directly so connected with all four valves that each may be given a rapid opening and closing movement, and be held open and nearly still at either end of its range by swinging the lines of connection nearly into the line between centers, thus permitting nearly a full opening of port to be maintained during an appreciable interval, and a free and complete steam supply and exhaust.

Fourth—A beautifully simple and effective method of detaching the steam valve from the driving mechanism, and of securing its rapid and certain closure at the proper moment to produce any desired expansion of steam.

Fifth—A direct connection of the governor, which varies the ratio of expansion while adjusting the power of the engine to the work to be done, and causes the variation of speed with changing loads to become a minimum.

Sixth—Making the latter adjustment in such a way as to throw the least possible work on the regulating mechanism, and thus to give the governor the greatest possible sensitiveness and accuracy of action.

Seventh—A form of frame and general design of engine which gives maximum strength and stiffness.

Briefly, the main points are: The rapid and wide opening of the steam and exhaust openings; the shortness and directness of the ports, the resulting small clearance and "dead" spaces; the quickness of closure of the steam valves; the adaptation of the main valve to the functions of a cut-off valve; the connections of the governor to the cut-off gear in such a manner as to determine the point of cut off without being itself hampered by the connections; the location of the exhaust ports at the under side of the cylinder, so as to drain the cylinder thoroughly, and the simple construction of the machine and its detail.

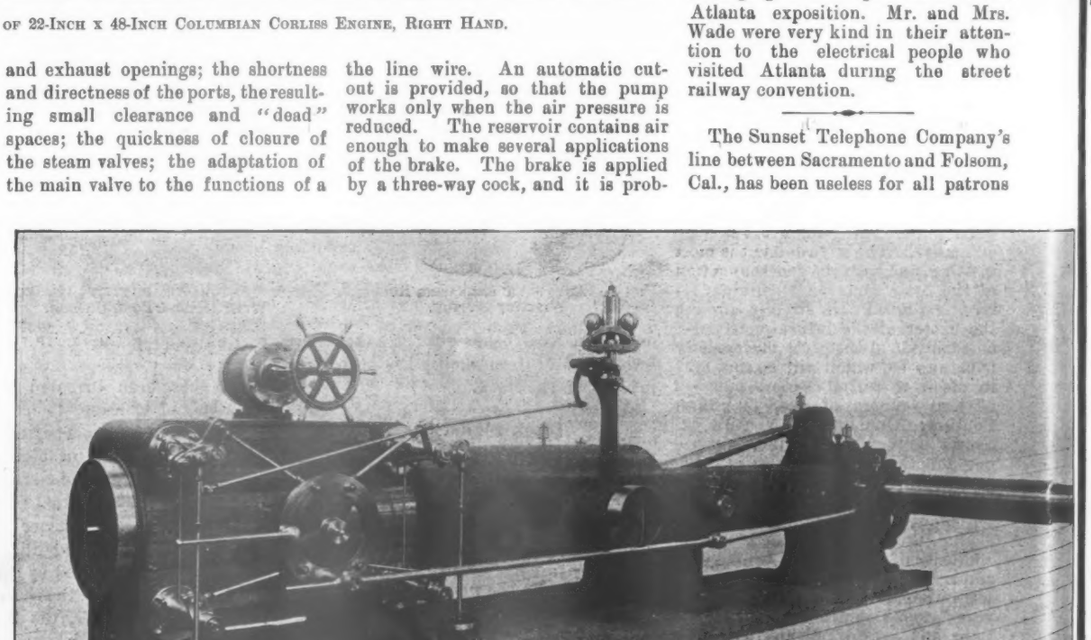


FIG. 2.—VALVE GEAR SIDE OF 22-INCH X 48-INCH COLUMBIAN, RIGHT HAND.

Air Brake for Electric Cars.

A new air brake for electric cars is being brought out by two Chicago inventors, Messrs. Frank W. Merritt and Arthur R. Roe. The principal novelty is the use of a reciprocating electric motor to compress the air, the motor taking its current from the line wire. An automatic cut-out is provided, so that the pump works only when the air pressure is reduced. The reservoir contains air enough to make several applications of the brake. The brake is applied by a three-way cock, and it is probable that the inventors will need to develop this part of the apparatus somewhat before they will attain success.

The board of assessors has refused the application of the Edison Electric Illuminating Company of Brooklyn, N. Y., for a reduction on its personal property of over $1,000,000.

PERSONAL.

Mayor Wallridge, of St. Louis, Mo., was in Boston last week inspecting that city's underground system.

Fred. Brainard Corey, consulting engineer and electrical expert, has removed his office to Room 33, 150 Devonshire street, Boston.

Mr. J. J. Carty, telephone engineer for the Metropolitan Telephone and Telegraph Company, of New York, is spending the Summer in Maine.

Mr. E. H. Stevens, of Bristol, Conn., has been appointed assistant treasurer and general manager of the Suburban and Electric Railway Company, of Elizabeth, N. J.

Mr. C. M. Morse, of the Buffalo Engineering Company, Buffalo, N. Y., spent a day in New York the early part of last week and favored the ELECTRICAL REVIEW with a call.

Mr. J. J. Gates, of the Perkins Electric Switch Manufacturing Company, Hartford, Conn., stopped awhile in New York last week on his way home from a western trip. Mr. Gates' faith in the ultimate triumph of high-class electrical goods is as firm as ever.

Mr. Geo. H. Wade, formerly with the Georgia Electric Light Company and a well-known electrical engineer of Atlanta, has taken an interest in the Electric Transportation Company and will assist Gen. C. H. Barney in managing this department of the Atlanta exposition. Mr. and Mrs. Wade were very kind in their attention to the electrical people who visited Atlanta during the street railway convention.

The Sunset Telephone Company's line between Sacramento and Folsom, Cal., has been useless for all patrons ever since the big generator of the Folsom Water Power Company commenced sending its supply of electric energy to Sacramento. The telephone wires parallel the power wires all the way to Folsom and in some places cross them, and the resulting induction in the Sunset telephone lines has necessitated the practical abandonment of the telephones, causing considerable inconveniences.

ELECTRICAL INTERFERENCE.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, CHICAGO, JULY 17, 1895, BY ARTHUR VAUGHAN ABBOTT, C. E.

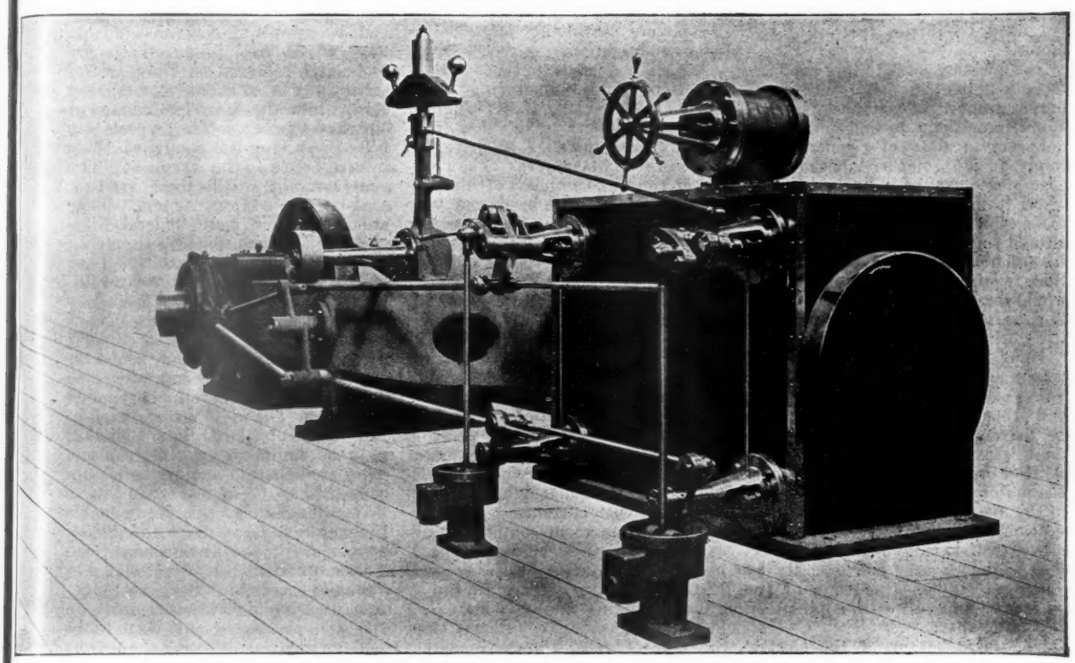


FIG. 3.—LANE & BODLEY COMPANY'S DOUBLE ECCENTRIC CORLISS VALVE GEAR ON 22-INCH x 48-INCH COLUMBIAN ENGINE.

The extensive commercial use of electricity has given rise to some curious questions, both legal and scientific, regarding the mutual rights of the proprietors of electric circuits and their relations to the public.

The subtile nature of electricity and its peculiar ability to produce the effect of action at a distance, apparently without the intervention of any intervening medium, increase the difficulty of dealing with such problems and lead occasionally to seemingly ridiculous conclusions. Thus, not long since an electric railway was plaintiff in an action to recover damages from some one who has been discovered stealing current from the trolley wire, but was non-suited, the presiding judge giving his opinion that as electricity was not a substance it could not be stolen. However correct such premises and logic may be, it is certain that few central station men would approve either of the conclusion or the practice it would apparently sanction. It is considered good equity, though not necessarily good law, that neither individuals nor corporations shall take any action on their own property, or upon the public highways that shall militate against or interfere with the enjoyment of similar rights by others. Electrical circuits not infrequently exercise a very serious mutual interference with each other, and occasionally become sources of danger to both life and property, and it is, therefore, pertinent to inquire into the conditions giving rise to such interference and the possible remedies. For convenience in treatment the subject may be divided into four general heads: First, leakage; second, induction disturbance: *a*, electro-magnetic induction, *b*, electrostatic induction; third, common path interference; fourth, electrolytic action.

1. Leakage—Every electrical plant consists of three parts. Some form of generator (dynamo or battery,) in which electrical energy is produced, a set of receiving mechanisms, or translating devices, whereby the energy evolved by the generators may be usefully employed, and a conducting circuit uniting the generators and receivers, and forming the road over which the electricity should travel. As there is no substance that is a perfect conductor, offering no opposition to the passage of the current, there is always a constant tendency for some of the electricity to leave its proper path and return to the generator by other and foreign routes. As there is no substance that is a perfect insulator, absolutely preventing all leakage, there will always be a certain, and usually an appreciable escape of electricity from even the best designed and constructed circuits. The difference in admittance between conductors and insulators is, however, usually so great that by proper design and appropriate construction all electric circuits may, at least in a commercial sense, be perfectly protected and all damage from such leakage obviated. Chiefly from the rapid growth of electrical development, the tendency has been to install carelessly and superintend and maintain imperfectly, hence, it is hardly an exaggeration to state that a notable proportion of the electrical plants now in operation are, or are likely to become, sources of danger to adjacent circuits and to life and property by reason of leakage. The remedy is obvious; skill in design, care and fidelity in execution and the adoption of the highest standard of electrical maintenance will eliminate all possible danger from this source. Electricity is the most powerful, and withal the most dangerous form of energy. Like fire, it is the best of servants but the worst of masters. Deservedly popular, it only rests with electrical engineers to secure its universal introduction, by insisting upon such quality of work as will inspire universal confidence.

2. Inductive Disturbance — The presence of electricity along a conducting circuit gives rise to very strange effects on adjacent bodies that, at present, can only be partially explained. These effects are made manifest by a disturbance of the electrical equilibrium existing in bodies adjacent, the intensity of which is inversely proportional to the remoteness of the perturbing circuit, directly proportional to the intensity of the electrical variations in the perturbing circuit, and but little affected by the character of the intervening medium. The process giving rise to such disturbance has been termed "induction," and manifests itself in two different ways, respectively termed "electro-magnetic" and "electrostatic induction."

a. Electromagnetic Induction — To Faraday is due the discovery that every electrical circuit in some mysterious way excites in the space surrounding it that peculiar state termed "a magnetic field," and varying intensity of which instantly responds to every electrical change; and the converse proposition that all changes in the magnetic field surrounding a closed conductor produce an accompanying electrical current in it.

Consider two circuits in reasonably close proximity to each other such as would occur with two wires on a pole line on the same side of the street, or cable conductors in the same trench. Assume one circuit to be carrying an alternating current varying from a positive to a negative maximum many times a second. With every wave we have a similar magnetic whirl, which travels outward from the wire as a center, looping its lines of force with all other neighboring circuits and exciting in them electro-motive forces that may severely interfere with their normal operation. The gravity of the disturbance thus produced will depend upon the exciting power of the perturbing circuit, the distance between the circuits and the sensitiveness of the translating devices placed on the adjacent conductor.

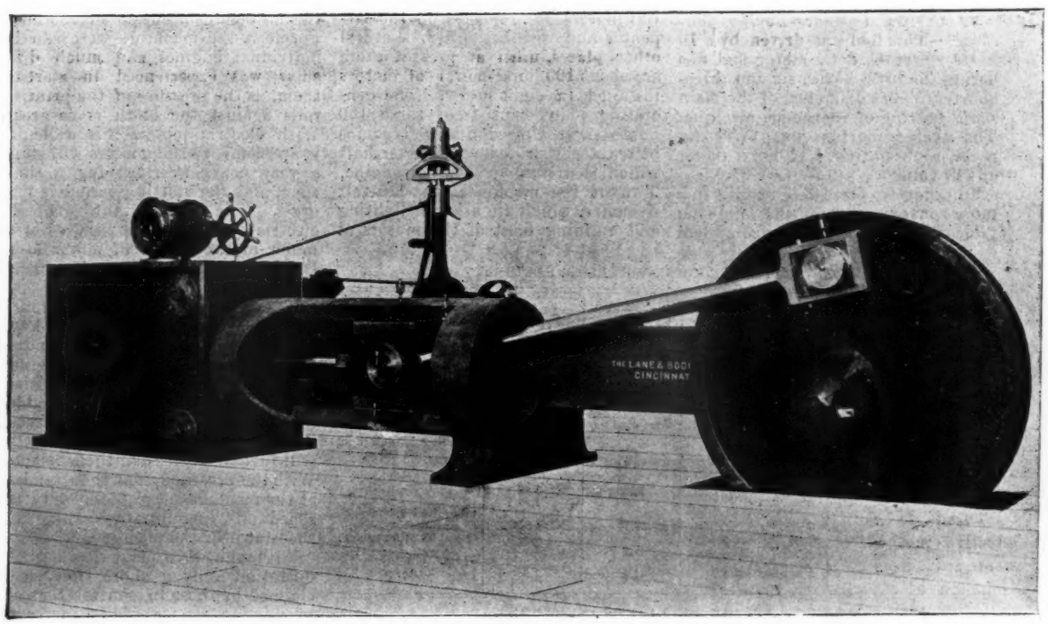


FIG. 4.—CRANK SIDE OF 22-INCH x 48-INCH COLUMBIAN ENGINE WITH STEEL LAGGING AND DISK CRANK, LEFT HAND.

(To be continued.)

ELECTRIC POWER IN FACTORIES AND MILLS.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NIAGARA FALLS, N. Y., JUNE 26, 1895, BY F. B. CROCKER, V. M. BENEDIKT AND A. F. ORMSBEE.

(Concluded from page 60.)

The following tests were made in the erecting shop of the De La Vergne Refrigerating Machine Company, at Port Morris, N. Y.:

1. *Planer.*—A large planer, 120 inches between posts, by 108 inches high, by 22 feet bed was driven by a C. & C. motor of 15 horse-power. The voltage employed was supposed to be 220, but due to an incorrect station voltmeter the actual potential only averaged 190 volts on the morning of this test. The average current was found to be 20.08 amperes, which at 190 volts represents 5.11 horse-power. At the reversal from the cutting to the back stroke the current increased to 85 amperes, equivalent to 21.65 horse-power. The power required during the cutting stroke was 4.76 horse-power, while on the return stroke the average was 5.73 horse-power.

2. *Drill Press.*—A drill press driven by a five horse-power C. & C. motor was tested in the afternoon. The potential was raised before this test so that the average was 215 volts. The power required when drilling various size holes is shown in the following table:

Size of Drill	Amperes.	Horse-Power.
Running Free.	3.	.865
7/8-in.	4.07	1.23
1/2-in.	4.37	1.26
1 1/2-in.	4.6	1.33

3. *Corliss Cylinder-Boring Machine.*—This tool was driven by a 10 horse-power C. & C. motor and was boring the brass boxes, six and three-quarter inches diameter, of the main shaft bearing of a large ice machine. The average current was 14.47 amperes, representing 4.17 horse-power at 215 volts.

In order to place the results in a more convenient form the following table of average powers was compiled:

TESTS AT THE CROCKER-WHEELER FACTORY.

No. of Test	Size of Motor.	Number of Tools Driven by Motor.	Average Amperes.	Average Horse-Power.	Remarks.
1	1.5 horse-power.	1 boring machine.	8.3	1.23	
2	1. "	1 drill press.	2.85	.42	Less than 1/4 full load of motor.
3	1. "	1 " "	2.86	.42	
4	1. "	1 " "	1.9	.28	
5	1. "	1 punch press.	4.86	.71	
6	1. "	1 gang drill.	4.75	.7	Drilling 1/4-inch and 5/8-inch holes.
7	3. "	2 machines.	10.04	1.48	
8	1. "	6 "	5.86	.86	All small machines.
9	3. "	7 "	13.36	1.97	
10	3. "	8 "	9.92	1.46	
11	7.5 "	2 "	33.1	4.87	Required 2.3 H.-P. to run shafting only.
12	10. "	20 "		4.78	Tested by Watt meter.
13	3. "	5 "	7.0	1.03	
14	3. "	1 engine lathe	11.4	1.68	Light cut taken by tool.

TESTS AT THE DE LA VERGNE WORKS.

1	15. horse-power.	1 planer.	20.08	5.11	Planer 10-in. x 9-in. x 22-in. Voltage 190, 7/8-in. drill.
2	5. "	1 drill press.	4.07	1.23	Voltage 215.
3	10. "	1 boring tool.	14.47	4.17	Voltage 215.

The results obtained in these tests show that the power required to drive machine tools has been considerably overestimated, for it will be noted that with a large majority of the tools tested, the motor was not more than one-half loaded, and in these cases it was seldom that the load equaled the full power of the motor, even for an instant. In the case of the large planer, although the motor was overloaded 50 per cent upon reversal of the bed, the average load was only one-third of the rated full load. With this machine, however, when the piece of work is very short, necessitating more rapid reversals, the average load will be much nearer the most economical output of the motor.

The question of running machine tools by individual motors or grouping a number of machines together and driving them by one motor does not seem to allow of a general solution. It would not be advisable, for example, to use the individual system where there are a number of small tools, each one of which requires only a small fraction of a horse-power. On the other hand, if we have a large tool that requires considerable power, it would seem to be far more economical to run it by a single motor, using as little belting and shafting as possible.

Many of the manufacturers of machinery are now supplying boring mills, punching presses, drill presses and other machine tools arranged to be driven by electric motors. In most cases all that is necessary is a shelf or bracket on the tool to support the motor and a gear wheel in place of the main pulley, unless a belt connection is preferable. A press or other tool having a large fly-wheel may be driven very conveniently by cutting teeth on the edge of the wheel, which gear with a pinion on the motor shaft.

The introduction of the electric system of distribution of power in the cotton industries of New England is now fairly begun. Although there are no large mills driven entirely by this system, a number of them have an electric plant and certain sections of the mill are driven by motors. An electric plant was installed four or five years ago in the works of the Silver Spring Bleaching and Dyeing Company, at Providence, R. I., but it was intended chiefly for lighting. But motors were placed in the carpenter and repair shops and several other places, until at present there are about 100 horse-power of motors installed in eight units. The generating plant consists of three 100 horse-power United States dynamos belted together from a countershaft which is driven by a Corliss engine. Two of the machines are 110-volt dynamos, which are used for lighting and running most of the motors at present. The third machine, which has just been installed, is a 500-volt Westinghouse power generator of the same type as the lighting machines. There is only one machine at present connected to the 500-volt circuit, a 30 horse-power motor which drives a centrifugal pump supplying a storage reservoir with water for use in the bleacheries. The electric plant in this mill is not of much importance yet, but its chances for development are very bright, since there are a number of machines now run by individual steam engines. These could be most advantageously replaced by electric motors, as they are in some cases a great distance from the boilers, involving large losses from condensation.

A visit was made to the works of the Donnell Manufacturing Company, at Pawtucket, R. I., where a very fine electric plant has very recently been installed to drive the calico printing machines. The problem of running this class of machinery by electric motors has been a very difficult one to solve, for the motor must be capable of running at a number of different speeds and running constantly at any given speed with a variable load. In this case it has been solved by the use of a modification of the Leonard system of motor regulation. The outfit for each printing machine consists of a motor and a dynamo of the same size, the field rheostat of the dynamo being placed alongside the printing machine. The speed of the motor is thus changed by varying the voltage of the particular dynamo which supplies it with currents.

The dynamo room contains 11 dynamos of the new moderate speed, four-pole type, made by the General Electric Company. They are run by a Corliss engine through a system of belting and ceiling countershafting. Six of these are 20-kilowatt machines and four are 25-kilowatt. The eleventh dynamo is a similar 20-kilowatt machine used for exciting the fields of the other dynamos. The normal potential is 250 volts, and is lowered in any particular dynamo when slower speed of the motor connected to that circuit is desired. This plant has been completed but a short time, and it was not possible to obtain any accurate figures showing the power used by the motors under various conditions of speed and load. Formerly the machines were run by individual engines and much difficulty was experienced in starting them, as the pressure of the printing rolls against the cloth is so great. With electric motors this difficulty is overcome, as the motors will stand a very heavy overload for a short time, and the starting torque is very great. The great advantage of the electric system as here used is not so much in the saving of power as in the convenience to the workmen, and hence the increased production.

The saving of power, however, is quite considerable, as in the old system steam was piped several hundred feet to the small individual engines, which were necessarily inefficient under the best conditions, and added to this the engines were run part of the time with partly closed throttle, still further decreasing the efficiency. With the present system the attendant at the machine may quickly vary the speed any amount by turning the rheostat near the machine.

Although this plant has been in operation only a short time, it is claimed by those in control that the production is materially increased. In a paper by Mr. S. B. Paine in *Power*, June, 1895, he states that the increase in the production amounted to more than 25 per cent, and that the quantity of "seconds" (inferior product) was also considerably reduced.

This is very important, as the men in charge of printing machines are skilled workmen of the higher order and a small saving in wages for a given production is of more value than a considerable saving of power.

A visit to Baltic and Taftville was also made to see the practical working of the well-known power transmission plant between these places. At Taftville, where the Ponemah mills are located, there is not sufficient water-power to drive all the machinery, so an electric plant was installed at Baltic, four and one-half miles up the river, where a dam had been built, giving an available head of 34 feet. The wheels are horizontal balanced turbines, two of them being rated at 800 horse-power each, while the third one is rated at 300 horse-power. The wheels are belted to a long line shaft, which is in turn belted to the dynamos. The generators, of which there are two, are placed in a separate room. They are of the three-phase General Electric type and are capable of supplying 250 kilowatts at 2,400 volts. They have 10 poles and run at 600 revolutions per minute, giving a frequency of 50 cycles per second. The field is excited by a three-kilowatt bipolar dynamo belted from the generator shaft. The power is transmitted to Taftville by a very well constructed pole line. The motors are located in the basement of the Ponemah mill near the engines which they replace. They are belted to pulleys which are connected to their respective shafts by friction clutches in order to enable the motors to be started without load, as they are of the synchronous type. The motors are identical with the dynamos except in having an induction winding of heavy bars sunk in the pole-pieces, to cause them to be self-starting. In starting the motors the switch in the induction circuit is closed and then the line is connected to the armature, causing it to start as an induction motor, without a very great torque, however. When the motor has nearly reached full speed the field is excited and it will speed up until it falls into step and then the induction switch is opened. This method of starting has two advantages: First, no auxiliary motor is needed; second, no device is required to tell when the motor is in synchronism with the generator.

One of these motors drives 1,200 looms, requiring an expenditure of about 155 horse-power. The other drives 500 looms and also the railway generators for the Norwich Electric Railway Company. The introduction of this plant has enabled the company to concentrate all its power for use in one mill, tending to decrease the cost of production, diminishing transportation charges and avoiding the use of any coal for steam power.

First Cost.—Practically the only objection which can be urged against the electric system is the fact that the first cost of installation is greater than with ordinary belting and shafting, but even this is questionable, since the authors know of cases in which the estimated total cost of installing the necessary belting and shafting was actually greater than the equivalent electric motor outfit. The electric system would be cheaper for example in the case of very long or scattered buildings or those containing many stories or rooms, in any of which cases the belting and shafting required would be very complicated and expensive. The use of belting and shafting requires a much stronger and more expensive roof or ceiling than the electric system.

Saving of Power.—It might seem that the electric system would actually consume more power than the ordinary plan, since it involves two transformations of energy. In most cases, however, if the power has to be distributed to a number of machines, particularly if they are located at any distance from the engine, the

loss of power is less with electric transmission. This is explained by the high efficiency of the dynamo and motor compared with the low efficiency of belt transmission as ordinarily practiced, involving as it often does very imperfect alignment and lubrication of the shafting. Perhaps the greatest saving, however, of the electric system is due to the fact that the consumption of energy entirely ceases when the tool stops. This stoppage in the case of the busiest tools amounts to at least 25 per cent of the nominal working hours throughout the year, and with large or special tools, which are not used so steadily, the stoppage is often as high as 50 to 75 per cent, since there are many whole days when they are not used at all.

Idleness due to strikes as well as to slack times must also be considered, and would usually amount to quite a large percentage in 10 years, for example. This assumes, of course, that a portion of the shop is running, which is usually the case even under such conditions. In short, with the mechanical system there is an enormous amount of shafting, idle pulleys and belting which runs for long periods of time, doing little or no useful work, but consuming considerable power.

Wherever electric motors can be substituted for a number of small engines scattered about, the saving in power is very great, not only because of the low efficiency of small steam engines, but also by the avoidance of condensation in long steam pipes.

Increased Output.—This is, perhaps, the most important advantage gained by the electric system, since, after all, the cost of power is a very small item, being, according to Mr. Richmond,* only about one per cent of the wages paid in average machine shop practice.

This increased output is secured by the greater convenience and promptness in starting and stopping as well as in regulating the speed of the machinery. The workman can, for example, temporarily increase the speed when the conditions are favorable, thereby saving considerable time.

Flexibility.—The great convenience of moving the tools and placing them in any desired position is another great advantage of the new system. The great adaptability of this system is particularly well shown in the case of a factory, which was almost completely destroyed by fire; nevertheless a few uninjured tools in a remote end of the building were operated successfully by means of electric motors within two days after the fire.

Speed Regulations.—The ordinary type of motor used in factories is the plain shunt-wound machine fed with constant potential current. The motor is started and varied in speed by means of a rheostat in the armature circuit. This simple arrangement answers very well in most cases, but for variable speed between wide limits a series-wound motor, controlled by a rheostat as in electric railway practice, may be preferable. In other cases some special method of regulation, such as the Leonard system or the "boost and retard" plan, may be adopted.

In concluding, the authors wish to express their sincerest thanks to the various companies for the courtesy shown by them and for the kind assistance which they rendered during the tests.

Work is progressing rapidly on the city's electric lighting plant at Independence, Iowa. The poles are set and the work of wiring will soon commence.

* *Engineering Magazine*, January, 1895.

ELECTRIC LIGHT FLASHES.

Webster, Mass., may have a municipal electric lighting plant.

Ottawa, Canada, has 40,000 inhabitants and uses 50,000 electric lights.

Albany, N. Y., has spent $930,922.38 for electric street lighting during the past 10 years.

In putting the overhead wires underground in Boston, 75,000,000 feet of wire will have to be removed.

The St. Louis papers are calling upon the city authorities to get down to active work in supplying the city with a subway system and ordering the overhead wires underground.

At Enosburg Falls, Vt., last week the Missisquoi River was so low that the electric lights in the streets of Richford had to be dispensed with, no water being available at the power house.

The Rutherford, Boiling Springs & Carlstadt Electric Light Company has signed a five-year contract with the borough of Rutherford, N. J., for 170 incandescent lights at $17.50 a year each.

The Michigan Central Railroad Company has ordered from the General Electric Company two 48-inch 100,000 candle-power search-lights, which will be placed at the Falls View station overlooking the Niagara Falls cataract. The object is to afford a view to tourists who reach Niagara Falls at night.

At the request of Superintendent C. O. Dunlap, of the Athens, Ohio, Insane Hospital, Governor McKinley and Auditor of State Poe have approved of the rejection of the lowest bid for furnishing the new electric light plant, $10,295, and awarded it for $11,395. It is represented that the second is the cheapest bid, all things considered.

The Edison Electric Light Company of Newburgh, N. Y., has been consolidated with the opposition company, the Newburgh Electric Light and Power Company. The agreement includes the capitalization of the new company at $250,000. It is to be known as the Consolidated Gas, Electric Light, Heat and Power Company, of Newburgh.

The Monongahela Electric Light and Power Company, of Homestead, Pa., has refused to sign a new contract with the borough for the lighting of the streets. The contract provides for better service and a removal of the plant to the river front. The company, however, has decided to improve its service and will put in two new engines and a dynamo.

The annual meeting of the Abington & Rockland Electric Light and Power Company was held in North Abington, Mass., on July 24, and the following officers were elected for the coming year: L. A. Crossett, president; C. N. Cobb, vice-president; G. W. Kelley, clerk; L. A. Crossett, C. N. Cobb, G. W. Kelley, M. N. Arnold, J. L. Greenwood, Everett Lane, John Spence, J. T. Richmond, E. P. Torrey, C. W. Torrey, directors. The company has had a most prosperous year and has declared a dividend of six per cent.

An issue which has a wide and most important bearing has arisen at Appleton, Wis. The government has ordered the local electric light and power company to entirely cease using the water of the Fox River, and the city found itself temporarily without either street car or lighting service. The quantity of water used by the company is said to be about 6,000 cubic feet for three hours daily, which is hardly more than is now running over the government canal and actually wasted; but the government order is peremptory and the only thing the company could do was to equip its station with steam as promptly as possible.

TELEPHONE FRANCHISE.

Sealed bids will be received at the Mayor's office until

Monday, August 12,

For the privilege of maintaining and operating within the city of Lexington a telephone system for a period of ten years. No bids received after 12 o'clock, noon.

The city reserves the right to reject any and all bids.

THE CITY OF LEXINGTON, KY.
By H. T. DUNCAN, Mayor.

Use the brush that gives the best results at least cost.

EXCELSIOR BRUSH.

Cheapest brush on the market, quality considered. Made of special tempered copper. Write for prices.

NICHOLAS ZOCC,
732 East 143d Street, N. Y. CITY

NOTICE.

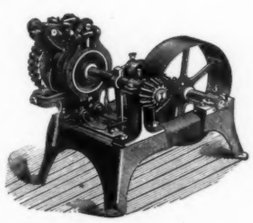
Bardstown, Ky., will receive bids for installation of Electric Lighting Plant until August 10, 1895. Specifications furnished upon application.

WEATHER-PROOF TRADE MARK "O.K." LINE AND HOUSE WIRES

AGENCIES:

ELECTRIC APPLIANCE CO., CHICAGO, ILL.
PETTINGELL-ANDREWS CO., BOSTON, MASS.
ELECTRICAL ENGINEERING CO. MINNEAPOLIS, MINN.
ST. LOUIS ELECT'L SUPPLY CO., ST. LOUIS, MO.
BRADFORD BELTING CO., CINCINNATI, O.

PHILLIPS INSULATED WIRE CO.,
NEW YORK OFFICE: 39 & 41 Cortlandt Street.
FACTORY: PAWTUCKET, R. I.



MARK A. REPLOGLE, Chief Engineer.

WATER-POWER Can be Governed for Electrical Work.

The limit of good government of water-power is often determined by the design and construction of plant. Consult us if possible before completing your plans.

With **REPLOGLE'S COMPOUND REGULATORS** we are prepared to undertake and **guarantee** the government of water-power for all purposes, including **Electric Railway, Power and Lighting Plants.** We make and sell all of Replogle's Electrical and Mechanical Governors and other devices for the government of water-power. Expert advice furnished on application. If results of your present system are not satisfactory, write us. Address all inquiries to

THE REPLOGLE GOVERNOR WORKS, Akron, Ohio.

FIRE.

The destruction of our Works by fire on April 7th was almost complete.
We have already resumed manufacturing and are making limited shipments, which are daily increasing.
Send us your orders. We will fill them with reasonable despatch, or advise you promptly if we cannot.

CROCKER-WHEELER ELECTRIC COMPANY,
Manufacturers and Electrical Engineers.
New York. Chicago. Boston. Philadelphia.
Sizes up to 250 H. P.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Telephone and Telegraph Companies.

ANDERSON, IND.—C. M. Harriman has sold the American Telephone Exchange at New Castle for $4,000 to J. W. Thompson and J. M. Maxom.

WATERTOWN, N. Y.—The Watertown Telephone Exchange Company has been incorporated with a capital of $50,000. Directors, August McCrea and J. R. McIntyre, of Gouverneur; John C. Streetor, Samuel Felt, G. C. Mullen, G. L. Newton, Francis A. Sherman, of Watertown.

LEBANON, IND.—Frank A. Reagan and fellow capitalists of this place have secured a telephone franchise at Brazil.

LOGANSPORT, IND.—E. B. Overshiner has been granted a franchise to construct a new telephone system here. The new plant is to be in operation by October 1.

CAMDEN, N. J.—The New Jersey Standard Telephone Company is endeavoring to secure enough subscribers in Camden to establish a service to compete with the Delaware & Atlantic Telegraph and Telephone Company.

NUNDA, N. Y.—It is proposed to have the Bell telephone line run through this place.

MANKATO, MINN.—A franchise has been granted for a competing telephone line.

SWEDESBORO, N. J.—Telephone connection between this place and Bridgeport is being agitated in the latter place.

WINTHROP, ME.—A branch telephone has been constructed from this place to Readfield, Kent's Hill and Mount Vernon. The line is a metallic circuit, equipped with long-distance telephones.

SHELBINA, MO.—Shelby County Telephone Company has been incorporated. Capital, $6,000. Incorporators, James M. McCreely, Henry Reinheimer, Thos. A. Gordon and others.

MERRILL, WIS.—Merrill Telephone Company has been incorporated with a capital stock of $10,000.

AMERICUS, GA.—Mr. B. M. Wilson, of the Southwest Georgia Telephone Company, has made arrangements with the Postal Telegraph Company to extend its line from this place to Dawson. Mr. Wilson tells us that from Dawson the Postal Telegraph Company will extend its line to Albany.

WINNIPEG, MAN.—It is reported that the Western Union Telegraph Company is making arrangements to take possession of the old abandoned telegraph line extending through British Columbia.

COLLEGEVILLE, PA.—The Delaware & Atlantic Telephone Company intends to extend the line from this place through Skippack, Lucon, Lederachville, Salfordville, Woxall, Sumneytown, Green Lane, Pennsburg.

ROCKVILLE, MD.—The Boyd's Telephone Company has completed a line of wires between Barnesville and Poolesville. A stock company has been organized at the latter place under the supervision of Prof. Glen Poole.

JEFFERSONVILLE, KY.—The American Telephone Company has been granted permission to establish its lines in this county.

NASHUA, N. H.—Another telephone exchange is to be established here.

MONTPELIER, IND.—The Montpelier Telephone Company has been incorporated with a capital stock of $2,000.

New Electric Railways.

BRADFORD, MASS.—The Lowell, Lawrence & Haverhill company has petitioned for the right to equip its line in this town with electricity, and also for a new location at Ward Hill, from the "Boston" road across Oxford street.

BALTIMORE, MD.—An electric railway, extending from Washington across the State of Maryland to Gettysburg, Pa., is one of the railway projects reported to be under consideration by Washington capitalists.

NEW ALBANY, IND.—The Highland electric railway, now in the hands of Henry Terstegge, will be sold to satisfy a mortgage of $50,000.

RACINE, WIS.—Among the Chicago capitalists who have become interested with Congressman McGann, of Chicago, in the Milwaukee street railway enterprise are John A. King, J. H. Witbeck, Daniel Scully and Bonney brothers. They may eventually extend the line to this place.

LANCASTER, OHIO.—The Lancaster street railway franchise and equipments, which have been in the hands of Receiver H. B. Peters, have been appraised by H. A. Martens, William Meikle and E. Dodson to the amount to $15,000.

PHILADELPHIA, PA.—It has been stated by several officials of the new Union Traction Company that the trolley railway through Fairmount Park will be built out of the proceeds of the first call of $3,000,000 on the stock of the Union Traction Company.

MATTEAWAN, N. Y.—The Citizens' Electric Railway Company of this place and Fishkill-on-Hudson has leased the line from this place to Fishkill village.

UNION, N. Y.—The electric road to this place promises to be a reality of this Summer, and President G. Tracy Rogers is preparing to expend the sum of $100,000 or more in building the road.

ST. LOUIS, MO.—Street car lines here are to be united, it is said, under the management of the National Railway Company of Chicago. The aggregate capital of these lines is $18,662,000.

PORTLAND, ME.—This place and Gorham are to be connected by electric road before October.

PALMER, MASS.—An electric railroad is to be built and funds are being raised to defray the expenses of making a survey.

HARTFORD, CONN.—The Newington Tramway Company is to build a new trolley road to connect Hartford and New Britain, Conn.

ST. ALBANS, VT.—The St. Albans Street Railway, incorporated by F. Stewart Stranahan, A. S. Richardson, Alfred A. Hall, E. C. Smith, A. O. Brainerd, George W. Crampton and others, to construct a street railway. Capital stock, $25,000. Work will probably be commenced soon.

LOWELL, MASS.—The Lowell & Suburban Street Railway have asked the Railroad Commissioners for the issuance of $400,000 worth of stock for the purpose of reconstruction and equipment with electricity. The hearing was adjourned until September.

Electric Light and Power.

SPRINGFIELD, MASS.—The Shelburne Falls Board of Trade held a special meeting recently and the subject of electric lighting for the village was discussed. Vice-President Bowen can give information concerning same.

LEWISTON, ME.—The Westinghouse Company is wiring the French monastery on Bartlett street for an electric lighting plant. It will require a 600-light dynamo and will be run by steam power.

CHESTER, PA.—The Chester Electric Light and Power Company has just closed a contract with Colonel Charles E. Hyatt for lighting the Pennsylvania Military college buildings with electric lights.

BELLEVILLE, OHIO.—A syndicate of Detroit men has applied to the township board of this place for the privilege of locating an electric light plant here.

HORTON, MICH.—This place contemplates a system of street lighting and a system of waterworks.

WORTHINGTON, MINN.—N. W. Harris & Company, Chicago, were the successful bidders for Worthington's $15,000 of five per cent electric light bonds at a premium of $135.

SUNAPEE, N. H.—An electric light plant is to be established here.

EAST BRIDGEWATER, MASS.—Work will soon be commenced by the Whitman Electric Light Company in the extension of the service to this town. The plant here will be enlarged to accommodate the residents of that place.

STEVEN'S POINT, WIS.—The Steven's Point Lighting Company, Gas Company, Water Company and Electric Railroad Company and the Clark Water Power Company have consolidated. The capital stock is said to be about $200,000.

LOS ANGELES, CAL.—The City Electric Power and Lighting Company has been incorporated to furnish electric power and lights, buying and selling real estate, borrowing and loaning money, purchasing oil wells and leasing ground for same and for building pipe lines. The capital stock is $200,000 in shares of $100. The incorporators are: F. N. Myers, J. H. Harris, W. E. DeGroot, C. D. Pillsbury, George M. Smith, Edward L. Doheney and Frederick L. Matthay. All are of Los Angeles.

Increase of Capital Stock.

BROOKLYN, N. Y.—It is the intention of the directors of the Brooklyn Municipal Electric Light Company to increase the capital stock from $500,000 to $1,000,000.

MASSILLON, OHIO.—The Farmers' Telephone Company has been granted an increase of capital stock from $10,000 to $20,000.

MILWAUKEE, WIS.—Milwaukee & Lake Winnebago Railroad Company filed amendment to charter increasing the capital to $2,580,000 and providing for an extension of its line from Neenah to Manitowoc, a distance of 45 miles.

New Manufacturing Companies.

PLAINFIELD, N. J.—The Citizens' Electric Company has been incorporated by Harry G. Runkle, Elias R. Pope, James C. Pope and others. Capital stock, $50,000.

MINNEAPOLIS, MINN.—The Clark Telephone and Construction Company has been incorporated with $300,000 capital stock. The incorporators are: Marion A. Clark, Earl C. Clark and A. S. Samson. The business will be confined to the manufacturing of all kinds of telephone merchandise.

The Pennsylvania Street Railway Association.

The fourth annual meeting of the Pennsylvania Street Railway Association will be held at Wilkesbarre, September 4 and 5. The members of the association will convene on Wednesday, September 4, at 11 o'clock A. M., at which meeting the usual annual business of the association will be transacted, including the election of officers of the association for the ensuing year. Papers on different subjects of interest to the members of the association will be read and discussed, and the general interests and welfare of street railways considered. There will also be an exhibition, in the large and commodious hall provided for that purpose, of street railway supplies by manufacturers and dealers, to an inspection of which the greater part of the next day will be devoted. Persons desiring to exhibit their supplies will write for space to John Graham, Esq., Wilkesbarre, Pa.

Thursday, September 5, will be devoted to an inspection of the exhibits of supply men, together with such entertainment as may be provided for the members of the association, including an excursion over the lines of the Wilkesbarre & Wyoming Valley Traction Company.

All street railway companies in the State of Pennsylvania, as also manufacturers and dealers in street railway supplies, who, by a recent amendment to the by-laws of the association, are eligible to associate membership, and all persons generally interested in promoting the interests of local rapid transit lines are not only invited, but earnestly requested to be present at the meeting and participate in its deliberations.

Those desiring membership, who have not already joined the association, can do so by sending the membership fee, $25, together with one year's annual dues, $10, to the secretary, S. P. Light, Lebanon, Pa. The advantages of co-operation by means of State organization are so well known to street railway interests that it is unnecessary to particularize them.

For further information, address JOHN A. RIGG, president; S. P. LIGHT, secretary, Lebanon, Pa.

Electrical Instruments and Fine Machinery.
MODEL AND EXPERIMENTAL WORK.
R. R. COMMUTATORS REFILLED.
E. V. BAILLARD, 106 Liberty St., N. Y.

ELECTRIC CONDENSERS.
WM. MARSHALL,
Manufacturer.
STANDARDS A SPECIALTY.
709 LEXINGTON AVENUE, NEW YORK.

EXPERIMENTAL WORK.
Metropolitan Chandelier and Electric Supply Works,
HUDSON & 12th STS., HOBOKEN, N. J.
Arc Light Repairing.

McINTIRE'S
PATENT CONNECTORS AND TERMINALS
FOR ALL ELECTRICAL PURPOSES.
THE C. McINTIRE CO.,
12-14 Franklin St., Newark, N. J.

W. R. OSTRANDER & CO.
No. 204 FULTON ST., NEW YORK.
Manufacturers of
SPEAKING TUBES, WHISTLES, ANNUNCIATORS.
Electric and Mechanical Bells.
FACTORY,
De Kalb Ave.,
BROOKLYN.
Send for Illustrated Catalogue.

TABLE PUSH

Send for new catalogue of
BELLS, PUSH BUTTONS, Etc.
HUEBEL & MANGER,
286-290 GRAHAM ST., BROOKLYN, N. Y.

THE FLEMING WOVEN WIRE DYNAMO BRUSH

WILFRID H. FLEMING,
Patentee and Sole Mfr.,
No. 393 Pearl Street,
NEW YORK.
Send for Descriptive Circular.